Anderson Goddard Ltd

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Independent Energy Specialists, SAP, SBEM, EPC's, U-Value & Condensation Risk, 2D & 3D Thermal Modelling

Post Construction Stage (PCS), Energy Report

Parkmount Road, MANCHESTER, M9 4AL

AG-79231-PCS-Rev A

2nd September 2025

Abacus House, 450 Warrington Road, Culcheth, Cheshire, WA3 5QX

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1. Executive summary

The original planning report provided by Energy + Environmental Standards Statement (AEW) for the development at Parkmount Road, MANCHESTER, M9 4AL recommended the following measures to achieve between 34-54% reduction in Carbon Emissions over and above the requirements of Approved Document Part L1 of the building regulations 2021.

- Improvements to fabric, Passivhaus Fabric values (Be Lean)
- Installation of High Efficient Heat Pump Technology (Be Clean)

The measures as installed provide the following As-Built improvement over Approved Document Part L1 of the building regulations 2021.

Reduction in Carbon Emissions 68.40% (Over AD.L1 2021)

2. Methodology

The findings of the initial recommendations report were incorporated into the final design for the development. Photographic Evidence Reports, Energy Performance Certification and Building Regulation Compliance Documentation have been provided to validate the energy and carbon performance of the design against the savings targeted.

The scheme was designed and constructed in accordance with the National Energy Hierarchy, incorporating the need to reduce energy use, then supply energy efficiently and to utilize renewable energy.

3. Local Planning Requirements

Manchester Core Strategy policy EN4 requires development to follow the energy hierarchy to reduce fuel poverty and decouple growth in the economy from increasing CO2 emissions and fuel costs. Policy EN4 encourages opportunities for low and zero carbon energy generating technologies and lower embodied carbon building materials.

Policy EN6 sets targets for a 15% reduction in carbon emissions against Part L 2010 through applying the energy hierarchy. Where the CO2 emissions reductions required under any future version of Part L Building Regulations (2021) are in excess of the % minimum requirement then building regulations standards take precedent.

Appendix A of the Core Strategy details the requirements for energy statement calculations (the calculations in Appendix A of this document reflect this format).
The emerging Places for Everyone development Plan Document is expected to require new development to meet net zero carbon targets by 2028 ahead of the Greater Manchester ambition to be a carbon neutral city-region by 2038.

4. Conclusion

Detailed energy performance data and the supporting system inputs are recorded in the Elmhurst Energy "BREL", and "Combined Report" documents for each individual units.

The development incorporated the following measures, as recommended in the original energy statement report:

Fabric (Passivhaus Approach)

- Ground floor 0.09w/m²K
- Walls 0.13w/m²K
- Roof 0.13w/m²K
- Windows 0.80w/m²K

- Air Change Rate (PHPP) 0.60ACH

MEP

- Dalkin Altherma EDLA09DA3V3 (ASHP)
- Airflow DV110 Adroit MVHR

The SAP and EPC results are tabulated in the table below.

	AD.L Volume 1 2021														
Plot N°	GIFA	DER	TER	DER / TER %	DER =< TER	DPER	TPER	DPER / TPER %	TPER =< TPER	DFEE	TFEE	DFEE / TFEE %	DFEE =< TFEE	SAP Rating	Band
1	120.24	3.38	10.86	68.87%	PASS	30.94	56.92	45.64%	PASS	34.37	38.99	11.84%	PASS	84	B
2	90.96	3.62	11.44	68.35%	PASS	32.83	59.93	45.21%	PASS	34.10	36.90	7.58%	PASS	84	B
3	90.96	3.63	11.59	68.67%	PASS	33.50	60.76	44.86%	PASS	34.22	37.64	9.08%	PASS	84	B
4	120.24	3.33	10.76	69.05%	PASS	30.72	56.43	45.56%	PASS	33.44	38.50	13.14%	PASS	84	B
5	120.24	3.36	10.91	69.20%	PASS	31.01	57.25	45.83%	PASS	34.01	39.23	13.30%	PASS	84	B
6	90.96	3.63	11.59	68.67%	PASS	33.50	60.76	44.86%	PASS	34.22	37.64	9.08%	PASS	84	B
7	90.96	3.62	11.44	68.35%	PASS	32.83	59.93	45.21%	PASS	34.10	36.90	7.58%	PASS	84	B
8	120.24	3.34	10.67	68.69%	PASS	30.53	55.95	45.43%	PASS	33.48	37.96	11.80%	PASS	84	B
9	120.24	3.38	11.00	69.27%	PASS	31.22	57.67	45.86%	PASS	34.51	39.76	13.20%	PASS	84	B
10	90.96	3.63	11.59	68.67%	PASS	33.50	60.76	44.86%	PASS	34.22	37.64	9.08%	PASS	84	B
11	90.96	3.63	11.59	68.67%	PASS	33.50	60.76	44.86%	PASS	34.22	37.64	9.08%	PASS	84	B
12	90.96	3.62	11.44	68.35%	PASS	32.83	59.93	45.21%	PASS	34.10	36.90	7.58%	PASS	84	B
13	120.24	3.34	10.67	68.69%	PASS	30.50	55.97	45.50%	PASS	33.38	37.89	11.90%	PASS	84	B
14	120.24	3.37	10.82	68.85%	PASS	30.84	56.73	45.63%	PASS	34.14	38.73	11.85%	PASS	84	B
15	90.96	3.62	11.44	68.35%	PASS	32.83	59.93	45.21%	PASS	34.10	36.90	7.58%	PASS	84	B
16	114.36	3.35	10.89	69.23%	PASS	30.82	57.23	46.14%	PASS	32.64	36.91	11.56%	PASS	84	B
17	90.96	3.62	11.44	68.35%	PASS	32.83	59.93	45.21%	PASS	34.10	36.90	7.58%	PASS	84	B
18	120.24	3.33	10.76	69.05%	PASS	30.72	56.43	45.56%	PASS	33.44	38.50	13.14%	PASS	84	B
19	37.97	4.79	16.80	71.48%	PASS	45.01	88.97	49.40%	PASS	28.20	40.27	29.97%	PASS	86	B
20	48.87	5.82	15.12	61.50%	PASS	56.47	79.82	29.25%	PASS	36.57	40.67	10.08%	PASS	81	B
21	37.97	4.13	15.88	73.99%	PASS	41.59	84.09	50.54%	PASS	24.40	35.74	31.72%	PASS	88	B
22	48.87	5.67	14.63	61.24%	PASS	54.72	77.24	29.15%	PASS	35.42	38.12	7.08%	PASS	81	B
23	37.97	4.57	15.88	71.22%	PASS	41.59	84.09	50.54%	PASS	26.20	35.74	26.69%	PASS	87	B
24	48.87	5.77	15.24	62.13%	PASS	56.36	80.53	30.01%	PASS	35.82	41.02	12.67%	PASS	81	B
Totals	2155.44	3.68	11.65	68.40%	PASS	34.02	61.14	44.35%	PASS	33.64	38.05	11.59%	PASS		

The SAP and EPC results show that all properties achieved the following:

- EPC ‘B’ Rating
- Carbon emission saving of 68%
- Primary energy saving of 44%
- Fabric efficiency rating of 11.5%

The scheme complies with local Planning and Building Regulations targets and acheives the targeted energy and carbon performance identified in the original energy statement report.

5. Appendix D

As-Built SAP caulations and Building Regulation Compliance Reports (BREL)

- BREL
- DER
- TER
- DFEE
- TFEE
- DPER
- TPER
- Energy Rating
- Energy Performance Certificate (EPC) costs
- EPC improvements
- Energy Report

Building Regulations England Part L (BREL) Compliance Report

Approved Document L1 2021 Edition, England assessed by Array SAP 10 program, Array

Date: Fri 03 Oct 2025 15:03:26

Project Information			
Assessed By	Paul Goddard	Building Type	House, End-terrace
OCDEA Registration	EES/005113	Assessment Date	2025-10-03

Dwelling Details			
Assessment Type	As built	Total Floor Area	120 m^2
Site Reference	78449-01	Plot Reference	001
Address	854 Rochdale Road, MANCHESTER, M9 8FA		

Client Details	
Name	-
Company	John Southworth
Address	Unit 10, Charles Street, DUKINFIELD, SK16 4SD

This report covers items included within the SAP calculations. It is not a complete report of regulations compliance.

1a Target emission rate and dwelling emission rate		
Fuel for main heating system	Electricity	
Target carbon dioxide emission rate	*10.86 $kgCO_2/m^2$*	
Dwelling carbon dioxide emission rate	3.38 $kgCO_2/m^2$	OK
1b Target primary energy rate and dwelling primary energy		
Target primary energy	*56.92 kWh_{PE}/m^2*	
Dwelling primary energy	35.67 kWh_{PE}/m^2	OK
1c Target fabric energy efficiency and dwelling fabric energy efficiency		
Target fabric energy efficiency	*39.0 kWh/m^2*	
Dwelling fabric energy efficiency	34.4 kWh/m^2	OK

2a Fabric U-values				
Element	***Maximum permitted average U-Value [W/m^2K]***	**Dwelling average U-Value [W/m^2K]**	**Element with highest individual U-Value**	
External walls	*0.26*	0.12	Walls (1) (0.13)	OK
Party walls	*0.2*	0	Party Wall (1) (0)	**N/A**
Curtain walls	*1.6*	0	N/A	**N/A**
Floors	*0.18*	0.09	Exposed Floor (0.14)	OK
Roofs	*0.16*	0.11	Roof (1) (0.13)	OK
Windows, doors, and roof windows	*1.6*	0.85	Front (1)	OK
Rooflights	*2.2*	N/A	N/A	**N/A**

2b Envelope elements (better than typically expected values are flagged with a subsequent (!))		
Name	**Net area [m^2]**	**U-Value [W/m^2K]**
Exposed wall: Walls (1)	113.38	0.13 **(!)**
Exposed wall: Walls (2)	16.77	0.09 **(!)**
Party wall: Party Wall (1)	47.6	0 **(!)**
Ground floor: GF, GF	47.06	0.09 **(!)**
Upper floor: Exposed Floor, Exposed Floor	2.72	0.14
Exposed roof: Roof (1)	15.51	0.13
Exposed roof: Roof (2)	17.54	0.13
Exposed roof: Roof (3)	26.38	0.09 **(!)**

2c Openings (better than typically expected values are flagged with a subsequent (!))				
Name	**Area [m^2]**	**Orientation**	**Frame factor**	**U-Value [W/m^2K]**
Front, Door	1.99	East	N/A	1 **(!)**
Front, Window	5.8	East	1.0	0.8 **(!)**
Rear, Window	2.81	West	1.0	0.8 **(!)**
Rear, Door	2.15	West	N/A	1 **(!)**
Side, Window	2.98	North	1.0	0.8 **(!)**

2d Thermal bridging (better than typically expected values are flagged with a subsequent (!))
Building part **1**: Thermal bridging calculated from linear thermal transmittances for each junction

Main element	Junction detail	Source	Psi value [W/mK]	Drawing / reference
External wall	E2: Other lintels (including other steel lintels)	Calculated by person with suitable expertise	0.115	Thermal Bridge Report
External wall	E3: Sill	Calculated by person with suitable expertise	0.017 **(!)**	Thermal Bridge Report
External wall	E4: Jamb	Calculated by person with suitable expertise	0.094	Thermal Bridge Report
External wall	E5: Ground floor (normal)	Calculated by person with suitable expertise	0.067	Thermal Bridge Report
External wall	E11: Eaves (insulation at rafter level)	Calculated by person with suitable expertise	0.025 **(!)**	Thermal Bridge Report
External wall	E16: Corner (normal)	Calculated by person with suitable expertise	0.068	Thermal Bridge Report
External wall	E12: Gable (insulation at ceiling level)	Calculated by person with suitable expertise	0.077	Thermal Bridge Report
External wall	E6: Intermediate floor within a dwelling	Calculated by person with suitable expertise	0.032 **(!)**	Thermal Bridge Report
External wall	E17: Corner (inverted - internal area greater than external area)	Calculated by person with suitable expertise	-0.029 **(!)**	Thermal Bridge Report
Party wall	P1: Ground floor	SAP table default	0.32	K1
External wall	E20: Exposed floor (normal)	Calculated by person with suitable expertise	0.079	Thermal Bridge Report
External wall	E21: Exposed floor (inverted)	Calculated by person with suitable expertise	0.063	Thermal Bridge Report
External wall	E13: Gable (insulation at rafter level)	Calculated by person with suitable expertise	0.074	Thermal Bridge Report
External wall	E18: Party wall between dwellings	Calculated by person with suitable expertise	0.092	Thermal Bridge Report
Roof	R6: Flat ceiling	Calculated by person with suitable expertise	-0.043	Thermal Bridge Report

3 Air permeability (better than typically expected values are flagged with a subsequent (!))		
Maximum permitted air permeability at 50Pa	*8 m^3/hm^2*	
Dwelling air permeability at 50Pa	5 m^3/hm^2, Measured value	OK
Air permeability test certificate reference		

4 Space heating	
Main heating system 1: Heat pump with radiators or underfloor heating - Electricity	
Efficiency	281.8%
Emitter type	Radiators
Flow temperature	45°C
System type	
Manufacturer	Daikin Europe NV
Model	EDLA09DA3V3
Commissioning	
Secondary heating system: N/A	
Fuel	N/A
Efficiency	N/A
Commissioning	

5 Hot water	
Cylinder/store - type: Cylinder	
Capacity	210 litres
Declared heat loss	1.58 kWh/day
Primary pipework insulated	Yes
Manufacturer	
Model	
Commissioning	
Waste water heat recovery system 1 - type: N/A	
Efficiency	
Manufacturer	
Model	

6 Controls		
Main heating 1 - type: Programmer, room thermostat and TRVs		
Function		
Ecodesign class		
Manufacturer		
Model		
Water heating - type: Cylinder thermostat and HW separately timed		
Manufacturer		
Model		

7 Lighting		
Minimum permitted light source efficacy	*75 lm/W*	
Lowest light source efficacy	80 lm/W	OK
External lights control	N/A	

8 Mechanical ventilation		
System type: Balanced whole-house mechanical ventilation with heat recovery		
Maximum permitted specific fan power	*1.5 W/(l/s)*	
Specific fan power	0.97 W/(l/s)	OK
Minimum permitted heat recovery efficiency	*73%*	
Heat recovery efficiency	89%	OK
Manufacturer/Model	DV110 Adroit	
Commissioning		

9 Local generation
N/A

10 Heat networks
N/A

11 Supporting documentary evidence	
Documentary evidence identified in 11.1 and 11.2 is needed to confirm the data values used for any calculations undertaken, manufacturer declarations made, and tests performed as reflected in this "As built" BREL Compliance Report are correct. 11.1 SAP Conventions, Appendix 1 (documentary evidence) schedules the minimum documentary evidence required. 11.2 Indicative photographic evidence of key stages during construction (guidance within Approved Document L, Volume 1 – Appendix B) that confirms the products identified in this BREL Compliance Report are used in this dwelling, and workmanship is of sufficient quality to support the calculated values claimed in 2a to 2d.	

12 Declarations	
a. Assessor Declaration	
This declaration by the assessor is confirmation that the contents of this BREL Compliance Report are a true and accurate reflection based upon the design and construction information submitted for this dwelling for the purpose of carrying out the assessment, and that the supporting documentary evidence (identified in 11.1 and 11.2) pursuant to Part L of the Building Regulations 2010 (as amended) has been reviewed in the course of preparing this BREL Compliance Report.	
Signed: Name:	Assessor ID: Date:
b. Client Declaration	
This declaration by the client is confirmation that the dwelling has been constructed and completed according to the specifications set out in this BREL Compliance Report, and that photographic evidence of key stages, as described in 11.2, has been provided to the Assessor for this dwelling.	
Signed: Name:	Organisation: Date:

Full SAP Calculation Printout

Property Reference	78449-01	**Issued on Date**	03/10/2025
Assessment Reference	001	**Prop Type Ref**	End
Property	854 Rochdale Road, MANCHESTER, M9 8FA		

SAP Rating	84 B	**DER**	3.38	**TER**	10.86
Environmental	97 A	**% DER < TER**			68.88
CO_2 Emissions (t/year)	0.39	**DFEE**	34.37	**TFEE**	38.99
Compliance Check	See BREL	**% DFEE < TFEE**			11.85
% DPER < TPER	37.33	**DPER**	35.67	**TPER**	56.92

Assessor Details	Mr. Daniel Goddard	**Assessor ID**	CP52-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.0600 (1b)	x	2.4800 (2b)	=	116.7088	(1b) - (3b)
First floor	49.7800 (1c)	x	2.7800 (2c)	=	138.3884	(1c) - (3c)
Second floor	23.4000 (1d)	x	2.7700 (2d)	=	64.8180	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	120.2400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	319.9152	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.2500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2125	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2709	0.2656	0.2603	0.2338	0.2284	0.2019	0.2019	0.1966	0.2125	0.2284	0.2391	0.2497	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	80.1000 (23c)

Effective ac	0.3704	0.3651	0.3598	0.3332	0.3279	0.3014	0.3014	0.2961	0.3120	0.3279	0.3386	0.3492	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door			4.1400	1.0000	4.1400			(26)
Window			11.5900	0.7752	8.9845			(27)
GF			47.0600	0.0900	4.2354	75.0000	3529.5000	(28a)
Exposed Floor			2.7200	0.1400	0.3808	20.0000	54.4000	(28b)
Main	129.1100	15.7300	113.3800	0.1300	14.7394	9.0000	1020.4200	(29a)
Dwarf Wall (PIRx0.72)	16.7700		16.7700	0.0900	1.5093	9.0000	150.9300	(29a)
PIJ	15.5100		15.5100	0.1300	2.0163	9.0000	139.5900	(30)
PIR	17.5400		17.5400	0.1300	2.2802	9.0000	157.8600	(30)
Residual Ceiling	26.3800		26.3800	0.0900	2.3742	9.0000	237.4200	(30)
Total net area of external elements Aum(A, m2)			255.0900					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		40.6601			(33)
Main dwelling								
Party Wall 1			47.6000	0.0000	0.0000	20.0000	952.0000	(32)

Timber	124.1700		9.0000	1117.5300 (32c)
FF	47.0600		18.0000	847.0800 (32d)
SF	23.4000		18.0000	421.2000 (32d)
GF	47.0600		9.0000	423.5400 (32e)
FF	23.4000		9.0000	210.6000 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 9262.0700 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 77.0299 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	10.6900	0.1150	1.2293
E3 Sill	10.6900	0.0170	0.1817
E4 Jamb	37.2000	0.0940	3.4968
E5 Ground floor (normal)	20.0500	0.0670	1.3434
E11 Eaves (insulation at rafter level)	18.1000	0.0250	0.4525
E16 Corner (normal)	24.0800	0.0680	1.6374
E12 Gable (insulation at ceiling level)	5.6600	0.0770	0.4358
E6 Intermediate floor within a dwelling	39.5500	0.0320	1.2656
E17 Corner (inverted - internal area greater than external area)	2.4800	-0.0290	-0.0719
P1 Party wall - Ground floor	9.0500	0.3200	2.8960
E20 Exposed floor (normal)	3.3800	0.0790	0.2670
E21 Exposed floor (inverted)	3.3800	0.0630	0.2129
E13 Gable (insulation at rafter level)	8.2800	0.0740	0.6127
E18 Party wall between dwellings	10.5200	0.0920	0.9678
R6 Flat ceiling	18.1000	-0.0430	-0.7783

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 14.1489 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 54.8090 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	39.1078	38.5470	37.9861	35.1819	34.6210	31.8168	31.8168	31.2559	32.9385	34.6210	35.7427	36.8644	(38)
Heat transfer coeff	93.9168	93.3560	92.7951	89.9909	89.4300	86.6258	86.6258	86.0649	87.7475	89.4300	90.5517	91.6734	(39)
Average = Sum(39)m / 12 =												89.8506	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7811	0.7764	0.7717	0.7484	0.7438	0.7204	0.7204	0.7158	0.7298	0.7438	0.7531	0.7624	(40)
HLP (average)												0.7473	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.8642 (42)
Hot water usage for mixer showers

72.2437	71.1580	69.5759	66.5490	64.3151	61.8240	60.4080	61.9781	63.6992	66.3739	69.4659	71.9669	(42a)

Hot water usage for baths

31.1904	30.7271	30.0748	28.8721	27.9715	26.9729	26.4334	27.0812	27.7865	28.8550	30.0826	31.0849	(42b)

Hot water usage for other uses

43.9627	42.3640	40.7654	39.1667	37.5681	35.9694	35.9694	37.5681	39.1667	40.7654	42.3640	43.9627	(42c)

Average daily hot water use (litres/day) 135.4907 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	147.3967	144.2491	140.4161	134.5878	129.8547	124.7663	122.8109	126.6274	130.6524	135.9943	141.9125	147.0144	(44)
Energy conte	233.4403	205.4088	215.8143	184.2439	174.8094	153.4147	148.5292	156.7911	161.1075	184.5430	202.1803	230.1891	(45)
Energy content (annual)										Total = Sum(45)m =		2250.4717	
Distribution loss (46)m = 0.15 x (45)m	35.0160	30.8113	32.3722	27.6366	26.2214	23.0122	22.2794	23.5187	24.1661	27.6815	30.3271	34.5284	(46)
Water storage loss:													
Store volume												210.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5800	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8532	(55)
Total storage loss	26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(56)
If cylinder contains dedicated solar storage	26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	283.1519	250.3096	265.5259	232.3519	224.5210	201.5227	198.2408	206.5027	209.2155	234.2546	250.2883	279.9007	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	283.1519	250.3096	265.5259	232.3519	224.5210	201.5227	198.2408	206.5027	209.2155	234.2546	250.2883	279.9007	(64)
										Total per year (kWh/year) = Sum(64)m =		2835.7857	(64)
12Total per year (kWh/year)												2836	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	117.3882	104.2191	111.5276	99.7475	97.8934	89.4968	89.1552	91.9023	92.0546	101.1298	105.7114	116.3071	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	172.1092	190.5495	172.1092	177.8462	172.1092	177.8462	172.1092	172.1092	177.8462	172.1092	177.8462	172.1092	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	285.5253	288.4881	281.0218	265.1269	245.0625	226.2048	213.6066	210.6438	218.1101	234.0050	254.0694	272.9272	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	(71)
Water heating gains (Table 5)	157.7798	155.0879	149.9026	138.5382	131.5771	124.3011	119.8323	123.5246	127.8537	135.9272	146.8213	156.3268	(72)
Total internal gains	681.3779	700.0891	668.9972	647.4749	614.7124	594.3156	571.5117	572.2412	589.7735	608.0049	644.7005	667.3267	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	2.9800	10.6334	0.3000	0.0000	0.7700	7.3198	(74)
East	5.8000	19.6403	0.3000	0.0000	0.7700	26.3140	(76)
West	2.8100	19.6403	0.3000	0.0000	0.7700	12.7487	(80)

Solar gains	46.3825	90.4035	149.6145	221.7174	276.3640	285.3175	270.6200	229.0857	174.9416	107.3243	57.7365	38.2254	(83)
Total gains	727.7604	790.4926	818.6117	869.1923	891.0764	879.6331	842.1317	801.3269	764.7151	715.3293	702.4370	705.5522	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	27.3944	27.5590	27.7256	28.5895	28.7688	29.7001	29.7001	29.8937	29.3205	28.7688	28.4125	28.0648	
alpha	2.8263	2.8373	2.8484	2.9060	2.9179	2.9800	2.9800	2.9929	2.9547	2.9179	2.8942	2.8710	
util living area	0.9354	0.9163	0.8884	0.8209	0.7185	0.5602	0.4282	0.4618	0.6546	0.8329	0.9089	0.9394	(86)
Living	18.9490	19.1968	19.5652	20.1191	20.5498	20.8535	20.9512	20.9384	20.7516	20.2138	19.5477	18.9549	
Non living	18.3662	18.6123	18.9765	19.5269	19.9344	20.2190	20.2951	20.2906	20.1296	19.6271	18.9746	18.3835	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	19.9508	19.1968	19.5652	20.1191	20.5498	20.8535	20.9512	20.9384	20.7516	20.2138	19.5477	19.2410	(87)
Th 2	20.2698	20.2738	20.2779	20.2983	20.3023	20.3228	20.3228	20.3269	20.3146	20.3023	20.2942	20.2860	(88)
util rest of house	0.9288	0.9080	0.8768	0.8020	0.6878	0.5140	0.3691	0.4027	0.6109	0.8116	0.8986	0.9333	(89)
MIT 2	19.2960	18.6123	18.9765	19.5269	19.9344	20.2190	20.2951	20.2906	20.1296	19.6271	18.9746	18.6496	(90)
Living area fraction										fLA = Living area / (4) =		0.2917	(91)
MIT	19.4870	18.7829	19.1483	19.6997	20.1139	20.4041	20.4865	20.4796	20.3111	19.7983	19.1418	18.8222	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4870	18.7829	19.1483	19.6997	20.1139	20.4041	20.4865	20.4796	20.3111	19.7983	19.1418	18.8222	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9208	0.8872	0.8555	0.7839	0.6789	0.5197	0.3838	0.4165	0.6107	0.7942	0.8784	0.9181	(94)
Useful gains	670.1545	701.2869	700.2955	681.3847	604.9227	457.1880	323.1700	333.7762	467.0144	568.1464	617.0299	647.7986	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1426.3154	1296.0470	1173.6964	971.8760	752.4578	502.7872	336.6722	351.1105	545.0069	822.6033	1090.4081	1340.4633	(97)
Space heating kWh	562.5837	399.6788	352.2103	209.1538	109.7661	0.0000	0.0000	0.0000	0.0000	189.3159	340.8323	515.3425	(98a)
Space heating requirement - total per year (kWh/year)												2678.8834	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	562.5837	399.6788	352.2103	209.1538	109.7661	0.0000	0.0000	0.0000	0.0000	189.3159	340.8323	515.3425	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2678.8834	
Space heating per m2											(98c) / (4) =	22.2795	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	281.8222	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	562.5837	399.6788	352.2103	209.1538	109.7661	0.0000	0.0000	0.0000	0.0000	189.3159	340.8323	515.3425	(98)
Space heating efficiency (main heating system 1)	281.8222	281.8222	281.8222	281.8222	281.8222	0.0000	0.0000	0.0000	0.0000	281.8222	281.8222	281.8222	(210)
Space heating fuel (main heating system)	199.6236	141.8195	124.9761	74.2148	38.9487	0.0000	0.0000	0.0000	0.0000	67.1757	120.9388	182.8609	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	283.1519	250.3096	265.5259	232.3519	224.5210	201.5227	198.2408	206.5027	209.2155	234.2546	250.2883	279.9007	(64)
Efficiency of water heater												279.7068	(216)
(217)m	279.7068	279.7068	279.7068	279.7068	279.7068	279.7068	279.7068	279.7068	279.7068	279.7068	279.7068	279.7068	(217)
Fuel for water heating, kWh/month	101.2317	89.4900	94.9301	83.0698	80.2701	72.0479	70.8745	73.8283	74.7981	83.7501	89.4824	100.0693	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	45.0156	40.6593	45.0156	43.5635	45.0156	43.5635	45.0156	45.0156	43.5635	45.0156	43.5635	45.0156	(231)
Lighting	36.2624	29.0911	26.1933	19.1903	14.8232	12.1106	13.5222	17.5766	22.8303	29.9546	33.8337	37.2703	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													

(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	950.5580	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	279.7068	
Water heating fuel used	1013.8424	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.3580)		
mechanical ventilation fans (SFP = 1.3580)	530.0227	(230a)
Total electricity for the above, kWh/year	530.0227	(231)
Electricity for lighting (calculated in Appendix L)	292.6585	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2787.0816	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	950.5580	0.1550	147.3090	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1013.8424	0.1410	142.9382	(264)
Space and water heating			290.2472	(265)
Pumps, fans and electric keep-hot	530.0227	0.1387	73.5207	(267)
Energy for lighting	292.6585	0.1443	42.2397	(268)
Total CO2, kg/year			406.0076	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.3800	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	950.5580	1.5737	1495.9070	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1013.8424	1.5213	1542.3806	(278)
Space and water heating			3038.2875	(279)
Pumps, fans and electric keep-hot	530.0227	1.5128	801.8183	(281)
Energy for lighting	292.6585	1.5338	448.8894	(282)
Total Primary energy kWh/year			4288.9952	(286)
Dwelling Primary energy Rate (DPER)			35.6700	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.0600	(1b) x	2.4800	(2b) =	116.7088	(1b) - (3b)
First floor	49.7800	(1c) x	2.7800	(2c) =	138.3884	(1c) - (3c)
Second floor	23.4000	(1d) x	2.7700	(2d) =	64.8180	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	120.2400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		319.9152	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	4 * 10 =	40.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1250	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	

Measured/design AP50	5.0000	(17)
Infiltration rate	0.3750	(18)
Number of sides sheltered	2	(19)
Shelter factor (20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) =	0.3188	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4064	0.3985	0.3905	0.3507	0.3427	0.3028	0.3028	0.2949	0.3188	0.3427	0.3586	0.3746	(22b)
Effective ac	0.5826	0.5794	0.5762	0.5615	0.5587	0.5459	0.5459	0.5435	0.5508	0.5587	0.5643	0.5701	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			4.1400	1.0000	4.1400			(26)
TER Opening Type			11.5900	1.1450	13.2710			(27)
GF			47.0600	0.1300	6.1178			(28a)
Exposed Floor			2.7200	0.1300	0.3536			(28b)
Main	129.1100	15.7300	113.3800	0.1800	20.4084			(29a)
Dwarf Wall (PIRx0.72)	16.7700		16.7700	0.1800	3.0186			(29a)
PIJ	15.5100		15.5100	0.1100	1.7061			(30)
PIR	17.5400		17.5400	0.1100	1.9294			(30)
Residual Ceiling	26.3800		26.3800	0.1100	2.9018			(30)
Total net area of external elements Aum(A, m2)			255.0900					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		53.8467			(33)
Main dwelling								
Party Wall 1			47.6000	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	77.0299	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	10.6900	0.0500	0.5345
E3 Sill	10.6900	0.0500	0.5345
E4 Jamb	37.2000	0.0500	1.8600
E5 Ground floor (normal)	20.0500	0.1600	3.2080
E11 Eaves (insulation at rafter level)	18.1000	0.0400	0.7240
E16 Corner (normal)	24.0800	0.0900	2.1672
E12 Gable (insulation at ceiling level)	5.6600	0.0600	0.3396
E6 Intermediate floor within a dwelling	39.5500	0.0000	0.0000
E17 Corner (inverted - internal area greater than external area)	2.4800	-0.0900	-0.2232
P1 Party wall - Ground floor	9.0500	0.0800	0.7240
E20 Exposed floor (normal)	3.3800	0.3200	1.0816
E21 Exposed floor (inverted)	3.3800	0.3200	1.0816
E13 Gable (insulation at rafter level)	8.2800	0.0800	0.6624
E18 Party wall between dwellings	10.5200	0.0600	0.6312
R6 Flat ceiling	18.1000	0.0600	1.0860

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	14.4114	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	68.2581	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	61.5060	61.1674	60.8355	59.2766	58.9849	57.6271	57.6271	57.3757	58.1501	58.9849	59.5749	60.1918	(38)
Heat transfer coeff	129.7641	129.4255	129.0936	127.5346	127.2430	125.8852	125.8852	125.6337	126.4082	127.2430	127.8330	128.4499	(39)
Average = Sum(39)m / 12 =												127.5333	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0792	1.0764	1.0736	1.0607	1.0582	1.0469	1.0469	1.0449	1.0513	1.0582	1.0631	1.0683	(40)
HLP (average)												1.0607	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.8642	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	72.2437	71.1580	69.5759	66.5490	64.3151	61.8240	60.4080	61.9781	63.6992	66.3739	69.4659	71.9669	(42a)
Hot water usage for baths	31.1904	30.7271	30.0748	28.8721	27.9715	26.9729	26.4334	27.0812	27.7865	28.8550	30.0826	31.0849	(42b)
Hot water usage for other uses	43.9627	42.3640	40.7654	39.1667	37.5681	35.9694	35.9694	37.5681	39.1667	40.7654	42.3640	43.9627	(42c)
Average daily hot water use (litres/day)												135.4907	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	147.3967	144.2491	140.4161	134.5878	129.8547	124.7663	122.8109	126.6274	130.6524	135.9943	141.9125	147.0144	(44)
Energy conte	233.4403	205.4088	215.8143	184.2439	174.8094	153.4147	148.5292	156.7911	161.1075	184.5430	202.1803	230.1891	(45)
Energy content (annual)										Total = Sum(45)m =		2250.4717	
Distribution loss (46)m = 0.15 x (45)m	35.0160	30.8113	32.3722	27.6366	26.2214	23.0122	22.2794	23.5187	24.1661	27.6815	30.3271	34.5284	(46)
Water storage loss:													
Store volume												210.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7016	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.9188	(55)
Total storage loss	28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842	(56)
If cylinder contains dedicated solar storage	28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	285.1869	252.1477	267.5609	234.3213	226.5560	203.4920	200.2757	208.5377	211.1848	236.2896	252.2577	281.9357	(62)
WWHRS	-33.0268	-29.2092	-30.5861	-25.3265	-23.6034	-20.1976	-18.9320	-20.1323	-20.8972	-24.6355	-27.9091	-32.4152	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	252.1601	222.9385	236.9748	208.9947	202.9525	183.2944	181.3437	188.4054	190.2876	211.6541	224.3486	249.5205	(64)

												Total per year (kWh/year) = Sum(64)m =	2552.8750 (64)
12Total per year (kWh/year)													2553 (64)
Electric shower(s)													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000 (64a)
												Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	0.0000 (64a)
Heat gains from water heating, kWh/month													
119.0162	105.6895	113.1555	101.3230	99.5214	91.0723	90.7832	93.5303	93.6301	102.7578	107.2868	117.9351		(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	167.5775	185.5322	167.5775	173.1634	167.5775	173.1634	167.5775	167.5775	173.1634	167.5775	173.1634	167.5775	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	285.5253	288.4881	281.0218	265.1269	245.0625	226.2048	213.6066	210.6438	218.1101	234.0050	254.0694	272.9272	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	(71)
Water heating gains (Table 5)													
	159.9680	157.2761	152.0908	140.7264	133.7653	126.4893	122.0205	125.7128	130.0418	138.1154	149.0095	158.5150	(72)
Total internal gains													
	682.0343	700.2599	669.6536	647.9802	615.3688	591.8209	569.1681	569.8976	587.2788	608.6613	645.2058	667.9831	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	2.9800	10.6334	0.6300	0.7000	0.7700	9.6841	(74)
East	5.8000	19.6403	0.6300	0.7000	0.7700	34.8135	(76)
West	2.8100	19.6403	0.6300	0.7000	0.7700	16.8665	(80)

Solar gains	61.3641	119.6038	197.9400	293.3321	365.6296	377.4750	358.0303	303.0804	231.4477	141.9901	76.3855	50.5723	(83)
Total gains	743.3983	819.8638	867.5936	941.3124	980.9984	969.2960	927.1984	872.9780	818.7266	750.6514	721.5913	718.5554	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
tau 19.8267	19.8786	19.9297	20.1733	20.2196	20.4376	20.4376	20.4786	20.3531	20.2196	20.1262	20.0296		
alpha 2.3218	2.3252	2.3286	2.3449	2.3480	2.3625	2.3625	2.3652	2.3569	2.3480	2.3417	2.3353		
util living area													
0.9436	0.9274	0.9030	0.8487	0.7639	0.6354	0.5109	0.5496	0.7240	0.8655	0.9243	0.9475		(86)
MIT 18.0314	18.3163	18.7903	19.4807	20.1133	20.6104	20.8353	20.7984	20.4273	19.6236	18.7368	17.9945		(87)
Th 2 20.0178	20.0202	20.0224	20.0331	20.0351	20.0444	20.0444	20.0461	20.0408	20.0351	20.0310	20.0268		(88)
util rest of house													
0.9368	0.9186	0.8906	0.8279	0.7282	0.5744	0.4228	0.4635	0.6712	0.8430	0.9137	0.9412		(89)
MIT 2 16.5267	16.8878	17.4877	18.3555	19.1272	19.7056	19.9349	19.9051	19.5112	18.5465	17.4310	16.4847		(90)
Living area fraction										fLA = Living area / (4) =		0.2917	(91)
MIT 16.9657	17.3046	17.8677	18.6838	19.4149	19.9695	20.1976	20.1657	19.7785	18.8608	17.8120	16.9252		(92)
Temperature adjustment												0.0000	
adjusted MIT 16.9657	17.3046	17.8677	18.6838	19.4149	19.9695	20.1976	20.1657	19.7785	18.8608	17.8120	16.9252		(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9065	0.8852	0.8545	0.7922	0.7016	0.5691	0.4379	0.4752	0.6547	0.8082	0.8804	0.9121	(94)
Useful gains	673.8861	725.7046	741.3446	745.7355	688.2197	551.6629	406.0488	414.7969	536.0299	606.6724	635.2982	655.4087	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
1643.5553	1605.4654	1467.4966	1247.7675	981.6665	675.9465	452.8882	473.1053	717.8052	1051.1232	1369.3473	1634.5450		(97)
Space heating kWh													
721.4339	591.1992	540.2571	361.4630	218.3244	0.0000	0.0000	0.0000	0.0000	330.6713	528.5153	728.4774		(98a)
Space heating requirement - total per year (kWh/year)												4020.3417	
Solar heating kWh													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
721.4339	591.1992	540.2571	361.4630	218.3244	0.0000	0.0000	0.0000	0.0000	330.6713	528.5153	728.4774		(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4020.3417	
Space heating per m2											(98c) / (4) =	33.4360	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement													
721.4339	591.1992	540.2571	361.4630	218.3244	0.0000	0.0000	0.0000	0.0000	330.6713	528.5153	728.4774		(98)
Space heating efficiency (main heating system 1)													
92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000		(210)
Space heating fuel (main heating system)													
781.6185	640.5192	585.3273	391.6176	236.5378	0.0000	0.0000	0.0000	0.0000	358.2571	572.6060	789.2496		(211)

Space heating efficiency (main heating system 2)												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating												
Water heating requirement												
252.1601	222.9385	236.9748	208.9947	202.9525	183.2944	181.3437	188.4054	190.2876	211.6541	224.3486	249.5205	(64)
Efficiency of water heater												
(217)m											79.8000	(216)
86.2797	86.1397	85.8480	85.2764	84.2238	79.8000	79.8000	79.8000	79.8000	85.0562	85.9126	86.3163	(217)
Fuel for water heating, kWh/month												
292.2588	258.8104	276.0401	245.0791	240.9681	229.6923	227.2477	236.0970	238.4556	248.8403	261.1358	289.0769	(219)
Space cooling fuel requirement												
(221)m												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa												
7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting												
34.8193	27.9333	25.1509	18.4266	14.2332	11.6287	12.9840	16.8771	21.9217	28.7625	32.4872	35.7870	(232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m												
-44.7970	-63.5321	-91.8110	-103.7373	-112.2119	-104.7888	-103.4625	-97.5171	-87.0638	-72.8780	-49.3734	-38.6828	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m												
-24.1081	-50.8729	-101.4358	-152.8352	-202.5887	-203.7992	-201.4340	-170.3381	-124.5455	-72.9457	-32.2454	-19.0542	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	4355.7331	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	3043.7020	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	281.0116	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-2326.0585	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	5440.3882	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	4355.7331	0.2100	914.7040	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3043.7020	0.2100	639.1774	(264)
Space and water heating			1553.8814	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	281.0116	0.1443	40.5587	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-969.8557	0.1345	-130.4353	
PV Unit electricity exported	-1356.2028	0.1258	-170.6058	
Total			-301.0411	(269)
Total CO2, kg/year			1305.3282	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.8600	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	4355.7331	1.1300	4921.9784	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3043.7020	1.1300	3439.3833	(278)
Space and water heating			8361.3617	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	281.0116	1.5338	431.0249	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-969.8557	1.4970	-1451.9176	
PV Unit electricity exported	-1356.2028	0.4618	-626.2333	
Total			-2078.1509	(283)
Total Primary energy kWh/year			6844.3365	(286)
Target Primary Energy Rate (TPER)			56.9200	(287)

Full SAP Calculation Printout

Property Reference	78449-01	**Issued on Date**	03/10/2025
Assessment Reference	001	**Prop Type Ref**	End
Property	854 Rochdale Road, MANCHESTER, M9 8FA		

SAP Rating	84 B	**DER**	3.38	**TER**	10.86
Environmental	97 A	**% DER < TER**			68.88
CO_2 Emissions (t/year)	0.39	**DFEE**	34.37	**TFEE**	38.99
Compliance Check	See BREL	**% DFEE < TFEE**			11.85
% DPER < TPER	37.33	**DPER**	35.67	**TPER**	56.92

Assessor Details	Mr. Daniel Goddard	**Assessor ID**	CP52-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.0600 (1b)	x	2.4800 (2b)	=	116.7088	(1b) - (3b)
First floor	49.7800 (1c)	x	2.7800 (2c)	=	138.3884	(1c) - (3c)
Second floor	23.4000 (1d)	x	2.7700 (2d)	=	64.8180	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	120.2400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	319.9152	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	4 * 10 =	40.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1250	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3750	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3188	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4064	0.3985	0.3905	0.3507	0.3427	0.3028	0.3028	0.2949	0.3188	0.3427	0.3586	0.3746	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5826	0.5794	0.5762	0.5615	0.5587	0.5459	0.5459	0.5435	0.5508	0.5587	0.5643	0.5701	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door			4.1400	1.0000	4.1400			(26)
Window			11.5900	0.7752	8.9845			(27)
GF			47.0600	0.0900	4.2354	75.0000	3529.5000	(28a)
Exposed Floor			2.7200	0.1400	0.3808	20.0000	54.4000	(28b)
Main	129.1100	15.7300	113.3800	0.1300	14.7394	9.0000	1020.4200	(29a)
Dwarf Wall (PIRx0.72)	16.7700		16.7700	0.0900	1.5093	9.0000	150.9300	(29a)
PIJ	15.5100		15.5100	0.1300	2.0163	9.0000	139.5900	(30)
PIR	17.5400		17.5400	0.1300	2.2802	9.0000	157.8600	(30)
Residual Ceiling	26.3800		26.3800	0.0900	2.3742	9.0000	237.4200	(30)
Total net area of external elements Aum(A, m2)			255.0900					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		40.6601			(33)
Main dwelling								
Party Wall 1			47.6000	0.0000	0.0000	20.0000	952.0000	(32)
Timber			124.1700			9.0000	1117.5300	(32c)
FF			47.0600			18.0000	847.0800	(32d)
SF			23.4000			18.0000	421.2000	(32d)

GF	47.0600		9.0000	423.5400 (32e)
FF	23.4000		9.0000	210.6000 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 9262.0700 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 77.0299 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	10.6900	0.1150	1.2293
E3 Sill	10.6900	0.0170	0.1817
E4 Jamb	37.2000	0.0940	3.4968
E5 Ground floor (normal)	20.0500	0.0670	1.3434
E11 Eaves (insulation at rafter level)	18.1000	0.0250	0.4525
E16 Corner (normal)	24.0800	0.0680	1.6374
E12 Gable (insulation at ceiling level)	5.6600	0.0770	0.4358
E6 Intermediate floor within a dwelling	39.5500	0.0320	1.2656
E17 Corner (inverted - internal area greater than external area)	2.4800	-0.0290	-0.0719
P1 Party wall - Ground floor	9.0500	0.3200	2.8960
E20 Exposed floor (normal)	3.3800	0.0790	0.2670
E21 Exposed floor (inverted)	3.3800	0.0630	0.2129
E13 Gable (insulation at rafter level)	8.2800	0.0740	0.6127
E18 Party wall between dwellings	10.5200	0.0920	0.9678
R6 Flat ceiling	18.1000	-0.0430	-0.7783

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 14.1489 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 54.8090 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	61.5060	61.1674	60.8355	59.2766	58.9849	57.6271	57.6271	57.3757	58.1501	58.9849	59.5749	60.1918	(38)
Heat transfer coeff	116.3150	115.9764	115.6445	114.0855	113.7939	112.4361	112.4361	112.1846	112.9591	113.7939	114.3839	115.0008	(39)
Average = Sum(39)m / 12 =												114.0841	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9674	0.9645	0.9618	0.9488	0.9464	0.9351	0.9351	0.9330	0.9394	0.9464	0.9513	0.9564	(40)
HLP (average)												0.9488	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.8642 (42)
Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

31.1904	30.7271	30.0748	28.8721	27.9715	26.9729	26.4334	27.0812	27.7865	28.8550	30.0826	31.0849	(42b)

Hot water usage for other uses

43.9627	42.3640	40.7654	39.1667	37.5681	35.9694	35.9694	37.5681	39.1667	40.7654	42.3640	43.9627	(42c)

Average daily hot water use (litres/day) 68.8844 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	75.1530	73.0911	70.8402	68.0388	65.5396	62.9423	62.4029	64.6493	66.9532	69.6204	72.4466	75.0476	(44)
Energy conte	119.0240	104.0808	108.8787	93.1417	88.2288	77.3949	75.4709	80.0493	82.5600	94.4742	103.2134	117.5064	(45)
Energy content (annual)										Total = Sum(45)m =		1144.0232	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	101.1704	88.4687	92.5469	79.1705	74.9945	65.7857	64.1503	68.0419	70.1760	80.3031	87.7314	99.8804	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	101.1704	88.4687	92.5469	79.1705	74.9945	65.7857	64.1503	68.0419	70.1760	80.3031	87.7314	99.8804	(64)
										Total per year (kWh/year) = Sum(64)m =		972.4197	(64)
12Total per year (kWh/year)												972	(64)
Electric shower(s)	57.8551	51.5494	56.2900	53.7168	54.7248	52.2022	53.9422	54.7248	53.7168	56.2900	55.2315	57.8551	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		658.0987	(64a)
Heat gains from water heating, kWh/month	39.7564	35.0045	37.2092	33.2218	32.4298	29.4970	29.5231	30.6917	30.9732	34.1483	35.7407	39.4339	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	172.1092	190.5495	172.1092	177.8462	172.1092	177.8462	172.1092	172.1092	177.8462	172.1092	177.8462	172.1092	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	285.5253	288.4881	281.0218	265.1269	245.0625	226.2048	213.6066	210.6438	218.1101	234.0050	254.0694	272.9272	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	(71)
Water heating gains (Table 5)	53.4360	52.0901	50.0124	46.1414	43.5885	40.9680	39.6816	41.2523	43.0183	45.8982	49.6399	53.0025	(72)
Total internal gains	577.0341	597.0913	569.1070	555.0781	526.7238	510.9825	491.3610	489.9688	504.9382	517.9759	547.5190	564.0025	(73)

6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains

	m2	Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	factor Table 6d	W	
North	2.9800	10.6334	0.3000	0.0000	0.7700	7.3198	(74)
East	5.8000	19.6403	0.3000	0.0000	0.7700	26.3140	(76)
West	2.8100	19.6403	0.3000	0.0000	0.7700	12.7487	(80)

Solar gains	46.3825	90.4035	149.6145	221.7174	276.3640	285.3175	270.6200	229.0857	174.9416	107.3243	57.7365	38.2254	(83)
Total gains	623.4166	687.4948	718.7215	776.7955	803.0878	796.3000	761.9811	719.0545	679.8798	625.3003	605.2556	602.2279	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	22.1192	22.1838	22.2475	22.5515	22.6093	22.8823	22.8823	22.9336	22.7764	22.6093	22.4926	22.3720	
alpha	2.4746	2.4789	2.4832	2.5034	2.5073	2.5255	2.5255	2.5289	2.5184	2.5073	2.4995	2.4915	
util living area	0.9584	0.9452	0.9264	0.8804	0.8053	0.6792	0.5514	0.5907	0.7628	0.8934	0.9426	0.9616	(86)
MIT	18.1435	18.4113	18.8476	19.5086	20.1179	20.6150	20.8394	20.8032	20.4393	19.6608	18.8198	18.1130	(87)
Th 2	20.1106	20.1130	20.1153	20.1262	20.1282	20.1378	20.1378	20.1395	20.1341	20.1282	20.1241	20.1198	(88)
util rest of house	0.9535	0.9387	0.9171	0.8638	0.7751	0.6239	0.4683	0.5103	0.7167	0.8754	0.9347	0.9571	(89)
MIT 2	17.4673	17.7335	18.1664	18.8208	19.4068	19.8668	20.0495	20.0262	19.7163	18.9776	18.1479	17.4430	(90)
Living area fraction										fLA = Living area / (4) =		0.2917	(91)
MIT	17.6646	17.9313	18.3652	19.0215	19.6143	20.0851	20.2800	20.2529	19.9272	19.1769	18.3439	17.6384	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.6646	17.9313	18.3652	19.0215	19.6143	20.0851	20.2800	20.2529	19.9272	19.1769	18.3439	17.6384	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9348	0.9173	0.8932	0.8384	0.7546	0.6202	0.4829	0.5218	0.7041	0.8511	0.9133	0.9394	(94)
Useful gains	582.7944	630.6458	641.9437	651.2538	605.9725	493.8900	367.9971	375.1671	478.7119	532.1832	552.8053	565.7468	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1554.5016	1511.3191	1372.1396	1154.7122	900.5962	616.7224	413.7636	432.2321	658.2389	976.0024	1286.1259	1545.4322	(97)
Space heating kWh	722.9502	591.8124	543.2657	362.4901	219.2000	0.0000	0.0000	0.0000	0.0000	330.2015	527.9908	728.8859	(98a)
Space heating requirement - total per year (kWh/year)												4026.7966	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	722.9502	591.8124	543.2657	362.4901	219.2000	0.0000	0.0000	0.0000	0.0000	330.2015	527.9908	728.8859	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4026.7966	
Space heating per m2											(98c) / (4) =	33.4897	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	1056.8992	832.0270	852.6033	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.6300	0.7037	0.6728	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	665.8615	585.5042	573.6311	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	839.4683	803.4127	756.8934	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	124.9969	162.1239	136.3471	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	31.2492	40.5310	34.0868	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												105.8670	(107)
Energy for space heating												33.4897	(99)
Energy for space cooling												0.8805	(108)
Total												34.3701	(109)
Fabric Energy Efficiency (DFEE)												34.4	(109)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.0600	(1b)	x 2.4800	(2b) =	116.7088	(1b) - (3b)
First floor	49.7800	(1c)	x 2.7800	(2c) =	138.3884	(1c) - (3c)
Second floor	23.4000	(1d)	x 2.7700	(2d) =	64.8180	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	120.2400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		319.9152	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	4 * 10 =	40.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1250	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3750	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3188	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4064	0.3985	0.3905	0.3507	0.3427	0.3028	0.3028	0.2949	0.3188	0.3427	0.3586	0.3746	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5826	0.5794	0.5762	0.5615	0.5587	0.5459	0.5459	0.5435	0.5508	0.5587	0.5643	0.5701	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			4.1400	1.0000	4.1400			(26)
TER Opening Type			11.5900	1.1450	13.2710			(27)
GF			47.0600	0.1300	6.1178			(28a)
Exposed Floor			2.7200	0.1300	0.3536			(28b)
Main	129.1100	15.7300	113.3800	0.1800	20.4084			(29a)
Dwarf Wall (PIRx0.72)	16.7700		16.7700	0.1800	3.0186			(29a)
PIJ	15.5100		15.5100	0.1100	1.7061			(30)
PIR	17.5400		17.5400	0.1100	1.9294			(30)
Residual Ceiling	26.3800		26.3800	0.1100	2.9018			(30)
Total net area of external elements Aum(A, m2)			255.0900					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		53.8467			(33)
Main dwelling								
Party Wall 1			47.6000	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 77.0299 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	10.6900	0.0500	0.5345
E3 Sill	10.6900	0.0500	0.5345
E4 Jamb	37.2000	0.0500	1.8600
E5 Ground floor (normal)	20.0500	0.1600	3.2080
E11 Eaves (insulation at rafter level)	18.1000	0.0400	0.7240
E16 Corner (normal)	24.0800	0.0900	2.1672
E12 Gable (insulation at ceiling level)	5.6600	0.0600	0.3396
E6 Intermediate floor within a dwelling	39.5500	0.0000	0.0000
E17 Corner (inverted - internal area greater than external area)	2.4800	-0.0900	-0.2232
P1 Party wall - Ground floor	9.0500	0.0800	0.7240
E20 Exposed floor (normal)	3.3800	0.3200	1.0816
E21 Exposed floor (inverted)	3.3800	0.3200	1.0816
E13 Gable (insulation at rafter level)	8.2800	0.0800	0.6624
E18 Party wall between dwellings	10.5200	0.0600	0.6312
R6 Flat ceiling	18.1000	0.0600	1.0860

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 14.4114 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 68.2581 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	61.5060	61.1674	60.8355	59.2766	58.9849	57.6271	57.6271	57.3757	58.1501	58.9849	59.5749	60.1918	(38)
Heat transfer coeff	129.7641	129.4255	129.0936	127.5346	127.2430	125.8852	125.8852	125.6337	126.4082	127.2430	127.8330	128.4499	(39)
Average = Sum(39)m / 12 =												127.5333	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0792	1.0764	1.0736	1.0607	1.0582	1.0469	1.0469	1.0449	1.0513	1.0582	1.0631	1.0683	(40)
HLP (average)												1.0607	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.8642 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	31.1904	30.7271	30.0748	28.8721	27.9715	26.9729	26.4334	27.0812	27.7865	28.8550	30.0826	31.0849	(42b)
Hot water usage for other uses	43.9627	42.3640	40.7654	39.1667	37.5681	35.9694	35.9694	37.5681	39.1667	40.7654	42.3640	43.9627	(42c)
Average daily hot water use (litres/day)												68.8844	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	75.1530	73.0911	70.8402	68.0388	65.5396	62.9423	62.4029	64.6493	66.9532	69.6204	72.4466	75.0476	(44)
Energy conte	119.0240	104.0808	108.8787	93.1417	88.2288	77.3949	75.4709	80.0493	82.5600	94.4742	103.2134	117.5064	(45)
Energy content (annual)										Total = Sum(45)m =		1144.0232	

Distribution loss (46)m = 0.15 x (45)m

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	101.1704	88.4687	92.5469	79.1705	74.9945	65.7857	64.1503	68.0419	70.1760	80.3031	87.7314	99.8804	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	101.1704	88.4687	92.5469	79.1705	74.9945	65.7857	64.1503	68.0419	70.1760	80.3031	87.7314	99.8804	(64)
									Total per year (kWh/year) = Sum(64)m =			972.4197	(64)
12Total per year (kWh/year)												972	(64)
Electric shower(s)													
	57.8551	51.5494	56.2900	53.7168	54.7248	52.2022	53.9422	54.7248	53.7168	56.2900	55.2315	57.8551	(64a)
								Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =				658.0987	(64a)
Heat gains from water heating, kWh/month													
	39.7564	35.0045	37.2092	33.2218	32.4298	29.4970	29.5231	30.6917	30.9732	34.1483	35.7407	39.4339	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	167.5775	185.5322	167.5775	173.1634	167.5775	173.1634	167.5775	167.5775	173.1634	167.5775	173.1634	167.5775	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	285.5253	288.4881	281.0218	265.1269	245.0625	226.2048	213.6066	210.6438	218.1101	234.0050	254.0694	272.9272	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	(71)
Water heating gains (Table 5)													
	53.4360	52.0901	50.0124	46.1414	43.5885	40.9680	39.6816	41.2523	43.0183	45.8982	49.6399	53.0025	(72)
Total internal gains													
	572.5023	592.0739	564.5752	550.3953	522.1920	506.2997	486.8292	485.4370	500.2553	513.4442	542.8362	559.4707	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	2.9800	10.6334	0.6300	0.7000	0.7700	9.6841	(74)
East	5.8000	19.6403	0.6300	0.7000	0.7700	34.8135	(76)
West	2.8100	19.6403	0.6300	0.7000	0.7700	16.8665	(80)

Solar gains	61.3641	119.6038	197.9400	293.3321	365.6296	377.4750	358.0303	303.0804	231.4477	141.9901	76.3855	50.5723	(83)
Total gains	633.8664	711.6778	762.5152	843.7274	887.8216	883.7747	844.8596	788.5175	731.7031	655.4343	619.2217	610.0429	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	19.8267	19.8786	19.9297	20.1733	20.2196	20.4376	20.4376	20.4786	20.3531	20.2196	20.1262	20.0296	
alpha	2.3218	2.3252	2.3286	2.3449	2.3480	2.3625	2.3625	2.3652	2.3569	2.3480	2.3417	2.3353	
util living area													
	0.9585	0.9443	0.9229	0.8731	0.7941	0.6695	0.5458	0.5882	0.7610	0.8928	0.9431	0.9619	(86)
MIT	17.8413	18.1372	18.6285	19.3538	20.0227	20.5607	20.8095	20.7655	20.3537	19.4918	18.5677	17.8031	(87)
Th 2	20.0178	20.0202	20.0224	20.0331	20.0351	20.0444	20.0444	20.0461	20.0408	20.0351	20.0310	20.0268	(88)
util rest of house													
	0.9533	0.9373	0.9126	0.8548	0.7608	0.6093	0.4554	0.5006	0.7112	0.8737	0.9348	0.9571	(89)
MIT 2	17.1106	17.4044	17.8911	18.6070	19.2482	19.7429	19.9441	19.9160	19.5683	18.7522	17.8408	17.0784	(90)
Living area fraction										fLA = Living area / (4) =		0.2917	(91)
MIT	17.3238	17.6182	18.1063	18.8249	19.4742	19.9815	20.1966	20.1639	19.7974	18.9680	18.0528	17.2898	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.3238	17.6182	18.1063	18.8249	19.4742	19.9815	20.1966	20.1639	19.7974	18.9680	18.0528	17.2898	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9333	0.9139	0.8861	0.8265	0.7382	0.6050	0.4710	0.5125	0.6965	0.8468	0.9117	0.9382	(94)
Useful gains	591.5951	650.4177	675.6697	697.3573	655.4116	534.6497	397.8920	404.0826	509.6462	555.0033	564.5273	572.3386	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1690.0159	1646.0569	1498.2944	1265.7715	989.2063	677.4522	452.7595	472.8692	720.1985	1064.7645	1400.1332	1681.3882	(97)
Space heating kWh													
	817.2250	669.0696	612.0328	409.2582	248.3433	0.0000	0.0000	0.0000	0.0000	379.2623	601.6362	825.1328	(98a)
Space heating requirement - total per year (kWh/year)												4561.9603	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	817.2250	669.0696	612.0328	409.2582	248.3433	0.0000	0.0000	0.0000	0.0000	379.2623	601.6362	825.1328	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4561.9603	
Space heating per m2											(98c) / (4) =	37.9405	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	1183.3208	931.5504	954.8165	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.6211	0.6924	0.6579	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	734.9731	645.0426	628.1694	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	946.7884	905.1521	842.8238	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	152.5070	193.5214	159.7028	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	38.1267	48.3804	39.9257	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												126.4328	(107)
Energy for space heating												37.9405	(99)
Energy for space cooling												1.0515	(108)
Total												38.9920	(109)
Fabric Energy Efficiency (TFEE)												39.0	(109)

Full SAP Calculation Printout

Property Reference	78449-01	**Issued on Date**	03/10/2025
Assessment Reference	001	**Prop Type Ref**	End
Property	854 Rochdale Road, MANCHESTER, M9 8FA		

SAP Rating	84 B	**DER**	3.38	**TER**	10.86
Environmental	97 A	**% DER < TER**			68.88
CO_2 Emissions (t/year)	0.39	**DFEE**	34.37	**TFEE**	38.99
Compliance Check	See BREL	**% DFEE < TFEE**			11.85
% DPER < TPER	37.33	**DPER**	35.67	**TPER**	56.92

Assessor Details	Mr. Daniel Goddard	**Assessor ID**	CP52-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.0600 (1b)	x	2.4800 (2b)	=	116.7088	(1b) - (3b)
First floor	49.7800 (1c)	x	2.7800 (2c)	=	138.3884	(1c) - (3c)
Second floor	23.4000 (1d)	x	2.7700 (2d)	=	64.8180	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	120.2400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	319.9152	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.2500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2125	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2709	0.2656	0.2603	0.2338	0.2284	0.2019	0.2019	0.1966	0.2125	0.2284	0.2391	0.2497	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	80.1000 (23c)

Effective ac	0.3704	0.3651	0.3598	0.3332	0.3279	0.3014	0.3014	0.2961	0.3120	0.3279	0.3386	0.3492	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door			4.1400	1.0000	4.1400			(26)
Window			11.5900	0.7752	8.9845			(27)
GF			47.0600	0.0900	4.2354	75.0000	3529.5000	(28a)
Exposed Floor			2.7200	0.1400	0.3808	20.0000	54.4000	(28b)
Main	129.1100	15.7300	113.3800	0.1300	14.7394	9.0000	1020.4200	(29a)
Dwarf Wall (PIRx0.72)	16.7700		16.7700	0.0900	1.5093	9.0000	150.9300	(29a)
PIJ	15.5100		15.5100	0.1300	2.0163	9.0000	139.5900	(30)
PIR	17.5400		17.5400	0.1300	2.2802	9.0000	157.8600	(30)
Residual Ceiling	26.3800		26.3800	0.0900	2.3742	9.0000	237.4200	(30)
Total net area of external elements Aum(A, m2)			255.0900					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		40.6601			(33)
Main dwelling								
Party Wall 1			47.6000	0.0000	0.0000	20.0000	952.0000	(32)

Timber	124.1700		9.0000	1117.5300 (32c)
FF	47.0600		18.0000	847.0800 (32d)
SF	23.4000		18.0000	421.2000 (32d)
GF	47.0600		9.0000	423.5400 (32e)
FF	23.4000		9.0000	210.6000 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 9262.0700 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 77.0299 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	10.6900	0.1150	1.2293
E3 Sill	10.6900	0.0170	0.1817
E4 Jamb	37.2000	0.0940	3.4968
E5 Ground floor (normal)	20.0500	0.0670	1.3434
E11 Eaves (insulation at rafter level)	18.1000	0.0250	0.4525
E16 Corner (normal)	24.0800	0.0680	1.6374
E12 Gable (insulation at ceiling level)	5.6600	0.0770	0.4358
E6 Intermediate floor within a dwelling	39.5500	0.0320	1.2656
E17 Corner (inverted - internal area greater than external area)	2.4800	-0.0290	-0.0719
P1 Party wall - Ground floor	9.0500	0.3200	2.8960
E20 Exposed floor (normal)	3.3800	0.0790	0.2670
E21 Exposed floor (inverted)	3.3800	0.0630	0.2129
E13 Gable (insulation at rafter level)	8.2800	0.0740	0.6127
E18 Party wall between dwellings	10.5200	0.0920	0.9678
R6 Flat ceiling	18.1000	-0.0430	-0.7783

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 14.1489 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 54.8090 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	39.1078	38.5470	37.9861	35.1819	34.6210	31.8168	31.8168	31.2559	32.9385	34.6210	35.7427	36.8644	(38)
Heat transfer coeff	93.9168	93.3560	92.7951	89.9909	89.4300	86.6258	86.6258	86.0649	87.7475	89.4300	90.5517	91.6734	(39)
Average = Sum(39)m / 12 =												89.8506	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7811	0.7764	0.7717	0.7484	0.7438	0.7204	0.7204	0.7158	0.7298	0.7438	0.7531	0.7624	(40)
HLP (average)												0.7473	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.8642 (42)
Hot water usage for mixer showers

72.2437	71.1580	69.5759	66.5490	64.3151	61.8240	60.4080	61.9781	63.6992	66.3739	69.4659	71.9669	(42a)

Hot water usage for baths

31.1904	30.7271	30.0748	28.8721	27.9715	26.9729	26.4334	27.0812	27.7865	28.8550	30.0826	31.0849	(42b)

Hot water usage for other uses

43.9627	42.3640	40.7654	39.1667	37.5681	35.9694	35.9694	37.5681	39.1667	40.7654	42.3640	43.9627	(42c)

Average daily hot water use (litres/day) 135.4907 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	147.3967	144.2491	140.4161	134.5878	129.8547	124.7663	122.8109	126.6274	130.6524	135.9943	141.9125	147.0144	(44)
Energy conte	233.4403	205.4088	215.8143	184.2439	174.8094	153.4147	148.5292	156.7911	161.1075	184.5430	202.1803	230.1891	(45)
Energy content (annual)										Total = Sum(45)m =		2250.4717	
Distribution loss (46)m = 0.15 x (45)m	35.0160	30.8113	32.3722	27.6366	26.2214	23.0122	22.2794	23.5187	24.1661	27.6815	30.3271	34.5284	(46)
Water storage loss:													
Store volume												210.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5800	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8532	(55)
Total storage loss	26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(56)
If cylinder contains dedicated solar storage	26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	283.1519	250.3096	265.5259	232.3519	224.5210	201.5227	198.2408	206.5027	209.2155	234.2546	250.2883	279.9007	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	283.1519	250.3096	265.5259	232.3519	224.5210	201.5227	198.2408	206.5027	209.2155	234.2546	250.2883	279.9007	(64)
										Total per year (kWh/year) = Sum(64)m =		2835.7857	(64)
12Total per year (kWh/year)												2836	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	117.3882	104.2191	111.5276	99.7475	97.8934	89.4968	89.1552	91.9023	92.0546	101.1298	105.7114	116.3071	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	172.1092	190.5495	172.1092	177.8462	172.1092	177.8462	172.1092	172.1092	177.8462	172.1092	177.8462	172.1092	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	285.5253	288.4881	281.0218	265.1269	245.0625	226.2048	213.6066	210.6438	218.1101	234.0050	254.0694	272.9272	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	(71)
Water heating gains (Table 5)	157.7798	155.0879	149.9026	138.5382	131.5771	124.3011	119.8323	123.5246	127.8537	135.9272	146.8213	156.3268	(72)
Total internal gains	681.3779	700.0891	668.9972	647.4749	614.7124	594.3156	571.5117	572.2412	589.7735	608.0049	644.7005	667.3267	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	2.9800	10.6334	0.3000	0.0000	0.7700	7.3198	(74)
East	5.8000	19.6403	0.3000	0.0000	0.7700	26.3140	(76)
West	2.8100	19.6403	0.3000	0.0000	0.7700	12.7487	(80)

Solar gains	46.3825	90.4035	149.6145	221.7174	276.3640	285.3175	270.6200	229.0857	174.9416	107.3243	57.7365	38.2254	(83)
Total gains	727.7604	790.4926	818.6117	869.1923	891.0764	879.6331	842.1317	801.3269	764.7151	715.3293	702.4370	705.5522	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	27.3944	27.5590	27.7256	28.5895	28.7688	29.7001	29.7001	29.8937	29.3205	28.7688	28.4125	28.0648	
alpha	2.8263	2.8373	2.8484	2.9060	2.9179	2.9800	2.9800	2.9929	2.9547	2.9179	2.8942	2.8710	
util living area	0.9354	0.9163	0.8884	0.8209	0.7185	0.5602	0.4282	0.4618	0.6546	0.8329	0.9089	0.9394	(86)
Living	18.9490	19.1968	19.5652	20.1191	20.5498	20.8535	20.9512	20.9384	20.7516	20.2138	19.5477	18.9549	
Non living	18.3662	18.6123	18.9765	19.5269	19.9344	20.2190	20.2951	20.2906	20.1296	19.6271	18.9746	18.3835	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	19.9508	19.1968	19.5652	20.1191	20.5498	20.8535	20.9512	20.9384	20.7516	20.2138	19.5477	19.2410	(87)
Th 2	20.2698	20.2738	20.2779	20.2983	20.3023	20.3228	20.3228	20.3269	20.3146	20.3023	20.2942	20.2860	(88)
util rest of house	0.9288	0.9080	0.8768	0.8020	0.6878	0.5140	0.3691	0.4027	0.6109	0.8116	0.8986	0.9333	(89)
MIT 2	19.2960	18.6123	18.9765	19.5269	19.9344	20.2190	20.2951	20.2906	20.1296	19.6271	18.9746	18.6496	(90)
Living area fraction										fLA = Living area / (4) =		0.2917	(91)
MIT	19.4870	18.7829	19.1483	19.6997	20.1139	20.4041	20.4865	20.4796	20.3111	19.7983	19.1418	18.8222	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4870	18.7829	19.1483	19.6997	20.1139	20.4041	20.4865	20.4796	20.3111	19.7983	19.1418	18.8222	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9208	0.8872	0.8555	0.7839	0.6789	0.5197	0.3838	0.4165	0.6107	0.7942	0.8784	0.9181	(94)
Useful gains	670.1545	701.2869	700.2955	681.3847	604.9227	457.1880	323.1700	333.7762	467.0144	568.1464	617.0299	647.7986	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1426.3154	1296.0470	1173.6964	971.8760	752.4578	502.7872	336.6722	351.1105	545.0069	822.6033	1090.4081	1340.4633	(97)
Space heating kWh	562.5837	399.6788	352.2103	209.1538	109.7661	0.0000	0.0000	0.0000	0.0000	189.3159	340.8323	515.3425	(98a)
Space heating requirement - total per year (kWh/year)												2678.8834	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	562.5837	399.6788	352.2103	209.1538	109.7661	0.0000	0.0000	0.0000	0.0000	189.3159	340.8323	515.3425	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2678.8834	
Space heating per m2											(98c) / (4) =	22.2795	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	281.8222	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	562.5837	399.6788	352.2103	209.1538	109.7661	0.0000	0.0000	0.0000	0.0000	189.3159	340.8323	515.3425	(98)
Space heating efficiency (main heating system 1)	281.8222	281.8222	281.8222	281.8222	281.8222	0.0000	0.0000	0.0000	0.0000	281.8222	281.8222	281.8222	(210)
Space heating fuel (main heating system)	199.6236	141.8195	124.9761	74.2148	38.9487	0.0000	0.0000	0.0000	0.0000	67.1757	120.9388	182.8609	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	283.1519	250.3096	265.5259	232.3519	224.5210	201.5227	198.2408	206.5027	209.2155	234.2546	250.2883	279.9007	(64)
Efficiency of water heater												279.7068	(216)
(217)m	279.7068	279.7068	279.7068	279.7068	279.7068	279.7068	279.7068	279.7068	279.7068	279.7068	279.7068	279.7068	(217)
Fuel for water heating, kWh/month	101.2317	89.4900	94.9301	83.0698	80.2701	72.0479	70.8745	73.8283	74.7981	83.7501	89.4824	100.0693	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	45.0156	40.6593	45.0156	43.5635	45.0156	43.5635	45.0156	45.0156	43.5635	45.0156	43.5635	45.0156	(231)
Lighting	36.2624	29.0911	26.1933	19.1903	14.8232	12.1106	13.5222	17.5766	22.8303	29.9546	33.8337	37.2703	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													

(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	950.5580	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	279.7068	
Water heating fuel used	1013.8424	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.3580)		
mechanical ventilation fans (SFP = 1.3580)	530.0227	(230a)
Total electricity for the above, kWh/year	530.0227	(231)
Electricity for lighting (calculated in Appendix L)	292.6585	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2787.0816	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	950.5580	0.1550	147.3090	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1013.8424	0.1410	142.9382	(264)
Space and water heating			290.2472	(265)
Pumps, fans and electric keep-hot	530.0227	0.1387	73.5207	(267)
Energy for lighting	292.6585	0.1443	42.2397	(268)
Total CO2, kg/year			406.0076	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.3800	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	950.5580	1.5737	1495.9070	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1013.8424	1.5213	1542.3806	(278)
Space and water heating			3038.2875	(279)
Pumps, fans and electric keep-hot	530.0227	1.5128	801.8183	(281)
Energy for lighting	292.6585	1.5338	448.8894	(282)
Total Primary energy kWh/year			4288.9952	(286)
Dwelling Primary energy Rate (DPER)			35.6700	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.0600	(1b) x	2.4800	(2b) =	116.7088	(1b) - (3b)
First floor	49.7800	(1c) x	2.7800	(2c) =	138.3884	(1c) - (3c)
Second floor	23.4000	(1d) x	2.7700	(2d) =	64.8180	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	120.2400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		319.9152	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	4 * 10 =	40.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1250	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	

Measured/design AP50	5.0000	(17)
Infiltration rate	0.3750	(18)
Number of sides sheltered	2	(19)
Shelter factor (20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) =	0.3188	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4064	0.3985	0.3905	0.3507	0.3427	0.3028	0.3028	0.2949	0.3188	0.3427	0.3586	0.3746	(22b)
Effective ac	0.5826	0.5794	0.5762	0.5615	0.5587	0.5459	0.5459	0.5435	0.5508	0.5587	0.5643	0.5701	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			4.1400	1.0000	4.1400			(26)
TER Opening Type			11.5900	1.1450	13.2710			(27)
GF			47.0600	0.1300	6.1178			(28a)
Exposed Floor			2.7200	0.1300	0.3536			(28b)
Main	129.1100	15.7300	113.3800	0.1800	20.4084			(29a)
Dwarf Wall (PIRx0.72)	16.7700		16.7700	0.1800	3.0186			(29a)
PIJ	15.5100		15.5100	0.1100	1.7061			(30)
PIR	17.5400		17.5400	0.1100	1.9294			(30)
Residual Ceiling	26.3800		26.3800	0.1100	2.9018			(30)
Total net area of external elements Aum(A, m2)			255.0900					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		53.8467			(33)
Main dwelling								
Party Wall 1			47.6000	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	77.0299	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	10.6900	0.0500	0.5345
E3 Sill	10.6900	0.0500	0.5345
E4 Jamb	37.2000	0.0500	1.8600
E5 Ground floor (normal)	20.0500	0.1600	3.2080
E11 Eaves (insulation at rafter level)	18.1000	0.0400	0.7240
E16 Corner (normal)	24.0800	0.0900	2.1672
E12 Gable (insulation at ceiling level)	5.6600	0.0600	0.3396
E6 Intermediate floor within a dwelling	39.5500	0.0000	0.0000
E17 Corner (inverted - internal area greater than external area)	2.4800	-0.0900	-0.2232
P1 Party wall - Ground floor	9.0500	0.0800	0.7240
E20 Exposed floor (normal)	3.3800	0.3200	1.0816
E21 Exposed floor (inverted)	3.3800	0.3200	1.0816
E13 Gable (insulation at rafter level)	8.2800	0.0800	0.6624
E18 Party wall between dwellings	10.5200	0.0600	0.6312
R6 Flat ceiling	18.1000	0.0600	1.0860

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	14.4114	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	68.2581	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	61.5060	61.1674	60.8355	59.2766	58.9849	57.6271	57.6271	57.3757	58.1501	58.9849	59.5749	60.1918	(38)
Heat transfer coeff	129.7641	129.4255	129.0936	127.5346	127.2430	125.8852	125.8852	125.6337	126.4082	127.2430	127.8330	128.4499	(39)
Average = Sum(39)m / 12 =												127.5333	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0792	1.0764	1.0736	1.0607	1.0582	1.0469	1.0469	1.0449	1.0513	1.0582	1.0631	1.0683	(40)
HLP (average)												1.0607	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.8642	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	72.2437	71.1580	69.5759	66.5490	64.3151	61.8240	60.4080	61.9781	63.6992	66.3739	69.4659	71.9669	(42a)
Hot water usage for baths	31.1904	30.7271	30.0748	28.8721	27.9715	26.9729	26.4334	27.0812	27.7865	28.8550	30.0826	31.0849	(42b)
Hot water usage for other uses	43.9627	42.3640	40.7654	39.1667	37.5681	35.9694	35.9694	37.5681	39.1667	40.7654	42.3640	43.9627	(42c)
Average daily hot water use (litres/day)												135.4907	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	147.3967	144.2491	140.4161	134.5878	129.8547	124.7663	122.8109	126.6274	130.6524	135.9943	141.9125	147.0144	(44)
Energy conte	233.4403	205.4088	215.8143	184.2439	174.8094	153.4147	148.5292	156.7911	161.1075	184.5430	202.1803	230.1891	(45)
Energy content (annual)										Total = Sum(45)m =		2250.4717	
Distribution loss (46)m = 0.15 x (45)m	35.0160	30.8113	32.3722	27.6366	26.2214	23.0122	22.2794	23.5187	24.1661	27.6815	30.3271	34.5284	(46)
Water storage loss:													
Store volume												210.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7016	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.9188	(55)
Total storage loss	28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842	(56)
If cylinder contains dedicated solar storage	28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	285.1869	252.1477	267.5609	234.3213	226.5560	203.4920	200.2757	208.5377	211.1848	236.2896	252.2577	281.9357	(62)
WWHRS	-33.0268	-29.2092	-30.5861	-25.3265	-23.6034	-20.1976	-18.9320	-20.1323	-20.8972	-24.6355	-27.9091	-32.4152	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	252.1601	222.9385	236.9748	208.9947	202.9525	183.2944	181.3437	188.4054	190.2876	211.6541	224.3486	249.5205	(64)

												Total per year (kWh/year) = Sum(64)m =	2552.8750 (64)
12Total per year (kWh/year)													2553 (64)
Electric shower(s)													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000 (64a)
												Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	0.0000 (64a)
Heat gains from water heating, kWh/month													
119.0162	105.6895	113.1555	101.3230	99.5214	91.0723	90.7832	93.5303	93.6301	102.7578	107.2868	117.9351		(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	167.5775	185.5322	167.5775	173.1634	167.5775	173.1634	167.5775	167.5775	173.1634	167.5775	173.1634	167.5775	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	285.5253	288.4881	281.0218	265.1269	245.0625	226.2048	213.6066	210.6438	218.1101	234.0050	254.0694	272.9272	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	(71)
Water heating gains (Table 5)													
	159.9680	157.2761	152.0908	140.7264	133.7653	126.4893	122.0205	125.7128	130.0418	138.1154	149.0095	158.5150	(72)
Total internal gains													
	682.0343	700.2599	669.6536	647.9802	615.3688	591.8209	569.1681	569.8976	587.2788	608.6613	645.2058	667.9831	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	2.9800	10.6334	0.6300	0.7000	0.7700	9.6841	(74)
East	5.8000	19.6403	0.6300	0.7000	0.7700	34.8135	(76)
West	2.8100	19.6403	0.6300	0.7000	0.7700	16.8665	(80)

Solar gains	61.3641	119.6038	197.9400	293.3321	365.6296	377.4750	358.0303	303.0804	231.4477	141.9901	76.3855	50.5723	(83)
Total gains	743.3983	819.8638	867.5936	941.3124	980.9984	969.2960	927.1984	872.9780	818.7266	750.6514	721.5913	718.5554	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
tau 19.8267	19.8786	19.9297	20.1733	20.2196	20.4376	20.4376	20.4786	20.3531	20.2196	20.1262	20.0296		
alpha 2.3218	2.3252	2.3286	2.3449	2.3480	2.3625	2.3625	2.3652	2.3569	2.3480	2.3417	2.3353		
util living area													
0.9436	0.9274	0.9030	0.8487	0.7639	0.6354	0.5109	0.5496	0.7240	0.8655	0.9243	0.9475		(86)
MIT 18.0314	18.3163	18.7903	19.4807	20.1133	20.6104	20.8353	20.7984	20.4273	19.6236	18.7368	17.9945		(87)
Th 2 20.0178	20.0202	20.0224	20.0331	20.0351	20.0444	20.0444	20.0461	20.0408	20.0351	20.0310	20.0268		(88)
util rest of house													
0.9368	0.9186	0.8906	0.8279	0.7282	0.5744	0.4228	0.4635	0.6712	0.8430	0.9137	0.9412		(89)
MIT 2 16.5267	16.8878	17.4877	18.3555	19.1272	19.7056	19.9349	19.9051	19.5112	18.5465	17.4310	16.4847		(90)
Living area fraction										fLA = Living area / (4) =		0.2917	(91)
MIT 16.9657	17.3046	17.8677	18.6838	19.4149	19.9695	20.1976	20.1657	19.7785	18.8608	17.8120	16.9252		(92)
Temperature adjustment												0.0000	
adjusted MIT 16.9657	17.3046	17.8677	18.6838	19.4149	19.9695	20.1976	20.1657	19.7785	18.8608	17.8120	16.9252		(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9065	0.8852	0.8545	0.7922	0.7016	0.5691	0.4379	0.4752	0.6547	0.8082	0.8804	0.9121	(94)
Useful gains	673.8861	725.7046	741.3446	745.7355	688.2197	551.6629	406.0488	414.7969	536.0299	606.6724	635.2982	655.4087	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
1643.5553	1605.4654	1467.4966	1247.7675	981.6665	675.9465	452.8882	473.1053	717.8052	1051.1232	1369.3473	1634.5450		(97)
Space heating kWh													
721.4339	591.1992	540.2571	361.4630	218.3244	0.0000	0.0000	0.0000	0.0000	330.6713	528.5153	728.4774		(98a)
Space heating requirement - total per year (kWh/year)												4020.3417	
Solar heating kWh													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
721.4339	591.1992	540.2571	361.4630	218.3244	0.0000	0.0000	0.0000	0.0000	330.6713	528.5153	728.4774		(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4020.3417	
Space heating per m2											(98c) / (4) =	33.4360	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement													
721.4339	591.1992	540.2571	361.4630	218.3244	0.0000	0.0000	0.0000	0.0000	330.6713	528.5153	728.4774		(98)
Space heating efficiency (main heating system 1)													
92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000		(210)
Space heating fuel (main heating system)													
781.6185	640.5192	585.3273	391.6176	236.5378	0.0000	0.0000	0.0000	0.0000	358.2571	572.6060	789.2496		(211)

Space heating efficiency (main heating system 2)												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating												
Water heating requirement												
252.1601	222.9385	236.9748	208.9947	202.9525	183.2944	181.3437	188.4054	190.2876	211.6541	224.3486	249.5205	(64)
Efficiency of water heater												
(217)m											79.8000	(216)
86.2797	86.1397	85.8480	85.2764	84.2238	79.8000	79.8000	79.8000	79.8000	85.0562	85.9126	86.3163	(217)
Fuel for water heating, kWh/month												
292.2588	258.8104	276.0401	245.0791	240.9681	229.6923	227.2477	236.0970	238.4556	248.8403	261.1358	289.0769	(219)
Space cooling fuel requirement												
(221)m												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa												
7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting												
34.8193	27.9333	25.1509	18.4266	14.2332	11.6287	12.9840	16.8771	21.9217	28.7625	32.4872	35.7870	(232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m												
-44.7970	-63.5321	-91.8110	-103.7373	-112.2119	-104.7888	-103.4625	-97.5171	-87.0638	-72.8780	-49.3734	-38.6828	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m												
-24.1081	-50.8729	-101.4358	-152.8352	-202.5887	-203.7992	-201.4340	-170.3381	-124.5455	-72.9457	-32.2454	-19.0542	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	4355.7331	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	3043.7020	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	281.0116	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-2326.0585	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	5440.3882	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	4355.7331	0.2100	914.7040	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3043.7020	0.2100	639.1774	(264)
Space and water heating			1553.8814	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	281.0116	0.1443	40.5587	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-969.8557	0.1345	-130.4353	
PV Unit electricity exported	-1356.2028	0.1258	-170.6058	
Total			-301.0411	(269)
Total CO2, kg/year			1305.3282	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.8600	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	4355.7331	1.1300	4921.9784	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3043.7020	1.1300	3439.3833	(278)
Space and water heating			8361.3617	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	281.0116	1.5338	431.0249	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-969.8557	1.4970	-1451.9176	
PV Unit electricity exported	-1356.2028	0.4618	-626.2333	
Total			-2078.1509	(283)
Total Primary energy kWh/year			6844.3365	(286)
Target Primary Energy Rate (TPER)			56.9200	(287)

Full SAP Calculation Printout

Property Reference	78449-01	**Issued on Date**	03/10/2025
Assessment Reference	001	**Prop Type Ref**	End
Property	854 Rochdale Road, MANCHESTER, M9 8FA		

SAP Rating	84 B	**DER**	3.38	**TER**	10.86
Environmental	97 A	**% DER < TER**			68.88
CO_2 Emissions (t/year)	0.39	**DFEE**	34.37	**TFEE**	38.99
Compliance Check	See BREL	**% DFEE < TFEE**			11.85
% DPER < TPER	37.33	**DPER**	35.67	**TPER**	56.92

Assessor Details	Mr. Daniel Goddard	**Assessor ID**	CP52-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.0600 (1b)	x	2.4800 (2b)	=	116.7088	(1b) - (3b)
First floor	49.7800 (1c)	x	2.7800 (2c)	=	138.3884	(1c) - (3c)
Second floor	23.4000 (1d)	x	2.7700 (2d)	=	64.8180	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	120.2400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	319.9152	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.2500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2125	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2709	0.2656	0.2603	0.2338	0.2284	0.2019	0.2019	0.1966	0.2125	0.2284	0.2391	0.2497	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	80.1000 (23c)

Effective ac	0.3704	0.3651	0.3598	0.3332	0.3279	0.3014	0.3014	0.2961	0.3120	0.3279	0.3386	0.3492	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door			4.1400	1.0000	4.1400			(26)
Window			11.5900	0.7752	8.9845			(27)
GF			47.0600	0.0900	4.2354	75.0000	3529.5000	(28a)
Exposed Floor			2.7200	0.1400	0.3808	20.0000	54.4000	(28b)
Main	129.1100	15.7300	113.3800	0.1300	14.7394	9.0000	1020.4200	(29a)
Dwarf Wall (PIRx0.72)	16.7700		16.7700	0.0900	1.5093	9.0000	150.9300	(29a)
PIJ	15.5100		15.5100	0.1300	2.0163	9.0000	139.5900	(30)
PIR	17.5400		17.5400	0.1300	2.2802	9.0000	157.8600	(30)
Residual Ceiling	26.3800		26.3800	0.0900	2.3742	9.0000	237.4200	(30)
Total net area of external elements Aum(A, m2)			255.0900					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		40.6601			(33)
Main dwelling								
Party Wall 1			47.6000	0.0000	0.0000	20.0000	952.0000	(32)

Timber	124.1700		9.0000	1117.5300 (32c)
FF	47.0600		18.0000	847.0800 (32d)
SF	23.4000		18.0000	421.2000 (32d)
GF	47.0600		9.0000	423.5400 (32e)
FF	23.4000		9.0000	210.6000 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 9262.0700 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 77.0299 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	10.6900	0.1150	1.2293
E3 Sill	10.6900	0.0170	0.1817
E4 Jamb	37.2000	0.0940	3.4968
E5 Ground floor (normal)	20.0500	0.0670	1.3434
E11 Eaves (insulation at rafter level)	18.1000	0.0250	0.4525
E16 Corner (normal)	24.0800	0.0680	1.6374
E12 Gable (insulation at ceiling level)	5.6600	0.0770	0.4358
E6 Intermediate floor within a dwelling	39.5500	0.0320	1.2656
E17 Corner (inverted - internal area greater than external area)	2.4800	-0.0290	-0.0719
P1 Party wall - Ground floor	9.0500	0.3200	2.8960
E20 Exposed floor (normal)	3.3800	0.0790	0.2670
E21 Exposed floor (inverted)	3.3800	0.0630	0.2129
E13 Gable (insulation at rafter level)	8.2800	0.0740	0.6127
E18 Party wall between dwellings	10.5200	0.0920	0.9678
R6 Flat ceiling	18.1000	-0.0430	-0.7783

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 14.1489 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 54.8090 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	39.1078	38.5470	37.9861	35.1819	34.6210	31.8168	31.8168	31.2559	32.9385	34.6210	35.7427	36.8644	(38)
Heat transfer coeff	93.9168	93.3560	92.7951	89.9909	89.4300	86.6258	86.6258	86.0649	87.7475	89.4300	90.5517	91.6734	(39)
Average = Sum(39)m / 12 =												89.8506	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7811	0.7764	0.7717	0.7484	0.7438	0.7204	0.7204	0.7158	0.7298	0.7438	0.7531	0.7624	(40)
HLP (average)												0.7473	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.8642 (42)
Hot water usage for mixer showers

72.2437	71.1580	69.5759	66.5490	64.3151	61.8240	60.4080	61.9781	63.6992	66.3739	69.4659	71.9669	(42a)

Hot water usage for baths

31.1904	30.7271	30.0748	28.8721	27.9715	26.9729	26.4334	27.0812	27.7865	28.8550	30.0826	31.0849	(42b)

Hot water usage for other uses

43.9627	42.3640	40.7654	39.1667	37.5681	35.9694	35.9694	37.5681	39.1667	40.7654	42.3640	43.9627	(42c)

Average daily hot water use (litres/day) 135.4907 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	147.3967	144.2491	140.4161	134.5878	129.8547	124.7663	122.8109	126.6274	130.6524	135.9943	141.9125	147.0144	(44)
Energy conte	233.4403	205.4088	215.8143	184.2439	174.8094	153.4147	148.5292	156.7911	161.1075	184.5430	202.1803	230.1891	(45)
Energy content (annual)										Total = Sum(45)m =		2250.4717	
Distribution loss (46)m = 0.15 x (45)m	35.0160	30.8113	32.3722	27.6366	26.2214	23.0122	22.2794	23.5187	24.1661	27.6815	30.3271	34.5284	(46)
Water storage loss:													
Store volume												210.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5800	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8532	(55)
Total storage loss	26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(56)
If cylinder contains dedicated solar storage	26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	283.1519	250.3096	265.5259	232.3519	224.5210	201.5227	198.2408	206.5027	209.2155	234.2546	250.2883	279.9007	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	283.1519	250.3096	265.5259	232.3519	224.5210	201.5227	198.2408	206.5027	209.2155	234.2546	250.2883	279.9007	(64)
										Total per year (kWh/year) = Sum(64)m =		2835.7857	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	117.3882	104.2191	111.5276	99.7475	97.8934	89.4968	89.1552	91.9023	92.0546	101.1298	105.7114	116.3071	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	41.4288	36.7967	29.9251	22.6552	16.9351	14.2973	15.4487	20.0808	26.9524	34.2223	39.9425	42.5803	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	426.1571	430.5793	419.4356	395.7119	365.7649	337.6190	318.8159	314.3937	325.5374	349.2611	379.2081	407.3540	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	(71)
Water heating gains (Table 5)	157.7798	155.0879	149.9026	138.5382	131.5771	124.3011	119.8323	123.5246	127.8537	135.9272	146.8213	156.3268	(72)
Total internal gains	737.7002	734.7984	711.5977	669.2397	626.6115	588.5518	566.4313	570.3336	592.6779	631.7451	678.3063	718.5954	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	2.9800	10.6334	0.3000	0.0000	0.7700	7.3198	(74)
East	5.8000	19.6403	0.3000	0.0000	0.7700	26.3140	(76)
West	2.8100	19.6403	0.3000	0.0000	0.7700	12.7487	(80)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	46.3825	90.4035	149.6145	221.7174	276.3640	285.3175	270.6200	229.0857	174.9416	107.3243	57.7365	38.2254	(83)
Total gains	784.0827	825.2019	861.2122	890.9571	902.9756	873.8693	837.0513	799.4193	767.6195	739.0694	736.0429	756.8209	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	27.3944	27.5590	27.7256	28.5895	28.7688	29.7001	29.7001	29.8937	29.3205	28.7688	28.4125	28.0648	
alpha	2.8263	2.8373	2.8484	2.9060	2.9179	2.9800	2.9800	2.9929	2.9547	2.9179	2.8942	2.8710	
util living area	0.9242	0.9086	0.8769	0.8132	0.7134	0.5630	0.4305	0.4628	0.6530	0.8231	0.8997	0.9293	(86)
Living	19.0504	19.2556	19.6300	20.1450	20.5589	20.8515	20.9505	20.9381	20.7532	20.2433	19.6034	19.0494	
Non living	18.4651	18.6693	19.0385	19.5508	19.9423	20.2176	20.2947	20.2904	20.1309	19.6541	19.0281	18.4758	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.0027	19.2556	19.6300	20.1450	20.5589	20.8515	20.9505	20.9381	20.7532	20.2433	19.6034	19.3222	(87)
Th 2	20.2698	20.2738	20.2779	20.2983	20.3023	20.3228	20.3228	20.3269	20.3146	20.3023	20.2942	20.2860	(88)
util rest of house	0.9167	0.8996	0.8645	0.7938	0.6825	0.5167	0.3711	0.4036	0.6094	0.8011	0.8886	0.9224	(89)
MIT 2	19.3466	18.6693	19.0385	19.5508	19.9423	20.2176	20.2947	20.2904	20.1309	19.6541	19.0281	18.7290	(90)
Living area fraction										fLA = Living area / (4) =		0.2917	(91)
MIT	19.5380	18.8404	19.2110	19.7242	20.1222	20.4025	20.4860	20.4794	20.3125	19.8260	19.1960	18.9021	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5380	18.8404	19.2110	19.7242	20.1222	20.4025	20.4860	20.4794	20.3125	19.8260	19.1960	18.9021	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9083	0.8784	0.8430	0.7762	0.6739	0.5223	0.3858	0.4174	0.6092	0.7842	0.8681	0.9063	(94)
Useful gains	712.1631	724.8228	726.0397	691.5252	608.5106	456.4471	322.9341	333.6607	467.6414	579.5798	638.9912	685.9312	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1431.1029	1301.4166	1179.5230	974.0766	753.1987	502.6474	336.6293	351.0894	545.1308	825.0810	1095.3107	1347.7902	(97)
Space heating kWh	534.8912	387.4711	337.3915	203.4370	107.6480	0.0000	0.0000	0.0000	0.0000	182.6529	328.5501	492.4231	(98a)
Space heating requirement - total per year (kWh/year)												2574.4648	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	534.8912	387.4711	337.3915	203.4370	107.6480	0.0000	0.0000	0.0000	0.0000	182.6529	328.5501	492.4231	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2574.4648	
Space heating per m2										(98c) / (4) =		21.4111	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Efficiency of main space heating system 1 (in %)	281.8222 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	534.8912	387.4711	337.3915	203.4370	107.6480	0.0000	0.0000	0.0000	0.0000	182.6529	328.5501	492.4231	(98)
Space heating efficiency (main heating system 1)	281.8222	281.8222	281.8222	281.8222	281.8222	0.0000	0.0000	0.0000	0.0000	281.8222	281.8222	281.8222	(210)
Space heating fuel (main heating system)	189.7974	137.4878	119.7179	72.1863	38.1971	0.0000	0.0000	0.0000	0.0000	64.8114	116.5806	174.7283	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	283.1519	250.3096	265.5259	232.3519	224.5210	201.5227	198.2408	206.5027	209.2155	234.2546	250.2883	279.9007	(64)
Efficiency of water heater												279.7068	(216)
(217)m	279.7068	279.7068	279.7068	279.7068	279.7068	279.7068	279.7068	279.7068	279.7068	279.7068	279.7068	279.7068	(217)
Fuel for water heating, kWh/month	101.2317	89.4900	94.9301	83.0698	80.2701	72.0479	70.8745	73.8283	74.7981	83.7501	89.4824	100.0693	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	45.0156	40.6593	45.0156	43.5635	45.0156	43.5635	45.0156	45.0156	43.5635	45.0156	43.5635	45.0156	(231)
Lighting	36.2624	29.0911	26.1933	19.1903	14.8232	12.1106	13.5222	17.5766	22.8303	29.9546	33.8337	37.2703	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)

Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	913.5067	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	279.7068	
Water heating fuel used	1013.8424	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.3580)		
mechanical ventilation fans (SFP = 1.3580)	530.0227	(230a)
Total electricity for the above, kWh/year	530.0227	(231)
Electricity for lighting (calculated in Appendix L)	292.6585	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2750.0304	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	913.5067	16.4900	150.6373	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1013.8424	16.4900	167.1826	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	530.0227	16.4900	87.4007	(249)
Energy for lighting	292.6585	16.4900	48.2594	(250)
Additional standing charges			0.0000	(251)
Total energy cost			453.4800	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.9880	(257)
SAP value		83.9849	
SAP rating (Section 12)		84	(258)
SAP band		B	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	913.5067	0.1549	141.5152	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1013.8424	0.1410	142.9382	(264)
Space and water heating			284.4535	(265)
Pumps, fans and electric keep-hot	530.0227	0.1387	73.5207	(267)
Energy for lighting	292.6585	0.1443	42.2397	(268)
Total CO2, kg/year			400.2138	(272)
CO2 emissions per m2			3.3300	(273)
EI value			96.7545	
EI rating			97	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.0600 (1b)	x	2.4800 (2b)	=	116.7088	(1b) - (3b)
First floor	49.7800 (1c)	x	2.7800 (2c)	=	138.3884	(1c) - (3c)
Second floor	23.4000 (1d)	x	2.7700 (2d)	=	64.8180	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	120.2400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	319.9152	(5)

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2. Ventilation rate

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m3 per hour

Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.2500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2125	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.6000	4.5000	4.5000	4.1000	4.2000	3.7000	3.5000	3.5000	3.7000	4.1000	4.1000	4.2000	(22)
Wind factor	1.1500	1.1250	1.1250	1.0250	1.0500	0.9250	0.8750	0.8750	0.9250	1.0250	1.0250	1.0500	(22a)
Adj infilt rate	0.2444	0.2391	0.2391	0.2178	0.2231	0.1966	0.1859	0.1859	0.1966	0.2178	0.2178	0.2231	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =		80.1000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.3439	0.3386	0.3386	0.3173	0.3226	0.2961	0.2854	0.2854	0.2961	0.3173	0.3173	0.3226	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door			4.1400	1.0000	4.1400			(26)
Window			11.5900	0.7752	8.9845			(27)
GF			47.0600	0.0900	4.2354	75.0000	3529.5000	(28a)
Exposed Floor			2.7200	0.1400	0.3808	20.0000	54.4000	(28b)
Main	129.1100	15.7300	113.3800	0.1300	14.7394	9.0000	1020.4200	(29a)
Dwarf Wall (PIRx0.72)	16.7700		16.7700	0.0900	1.5093	9.0000	150.9300	(29a)
PIJ	15.5100		15.5100	0.1300	2.0163	9.0000	139.5900	(30)
PIR	17.5400		17.5400	0.1300	2.2802	9.0000	157.8600	(30)
Residual Ceiling	26.3800		26.3800	0.0900	2.3742	9.0000	237.4200	(30)
Total net area of external elements Aum(A, m2)			255.0900					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		40.6601			(33)
Main dwelling								
Party Wall 1			47.6000	0.0000	0.0000	20.0000	952.0000	(32)
Timber			124.1700			9.0000	1117.5300	(32c)
FF			47.0600			18.0000	847.0800	(32d)
SF			23.4000			18.0000	421.2000	(32d)
GF			47.0600			9.0000	423.5400	(32e)
FF			23.4000			9.0000	210.6000	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	9262.0700 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		77.0299 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	10.6900	0.1150	1.2293
E3 Sill	10.6900	0.0170	0.1817
E4 Jamb	37.2000	0.0940	3.4968
E5 Ground floor (normal)	20.0500	0.0670	1.3434
E11 Eaves (insulation at rafter level)	18.1000	0.0250	0.4525
E16 Corner (normal)	24.0800	0.0680	1.6374
E12 Gable (insulation at ceiling level)	5.6600	0.0770	0.4358
E6 Intermediate floor within a dwelling	39.5500	0.0320	1.2656
E17 Corner (inverted - internal area greater than external area)	2.4800	-0.0290	-0.0719
P1 Party wall - Ground floor	9.0500	0.3200	2.8960
E20 Exposed floor (normal)	3.3800	0.0790	0.2670
E21 Exposed floor (inverted)	3.3800	0.0630	0.2129
E13 Gable (insulation at rafter level)	8.2800	0.0740	0.6127
E18 Party wall between dwellings	10.5200	0.0920	0.9678
R6 Flat ceiling	18.1000	-0.0430	-0.7783

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		14.1489 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	54.8090 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	36.3036	35.7427	35.7427	33.4993	34.0602	31.2559	30.1342	30.1342	31.2559	33.4993	33.4993	34.0602	(38)
Heat transfer coeff	91.1126	90.5517	90.5517	88.3083	88.8692	86.0649	84.9432	84.9432	86.0649	88.3083	88.3083	88.8692	(39)
Average = Sum(39)m / 12 =												88.0746	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7578	0.7531	0.7531	0.7344	0.7391	0.7158	0.7064	0.7064	0.7158	0.7344	0.7344	0.7391	(40)
HLP (average)												0.7325	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.8642 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
72.2437	71.1580	69.5759	66.5490	64.3151	61.8240	60.4080	61.9781	63.6992	66.3739	69.4659	71.9669	(42a)

Hot water usage for baths

31.1904	30.7271	30.0748	28.8721	27.9715	26.9729	26.4334	27.0812	27.7865	28.8550	30.0826	31.0849	(42b)

Hot water usage for other uses

43.9627	42.3640	40.7654	39.1667	37.5681	35.9694	35.9694	37.5681	39.1667	40.7654	42.3640	43.9627	(42c)

Average daily hot water use (litres/day)	135.4907 (43)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Daily hot water use

	147.3967	144.2491	140.4161	134.5878	129.8547	124.7663	122.8109	126.6274	130.6524	135.9943	141.9125	147.0144	(44)
Energy conte	233.4403	205.4088	215.8143	184.2439	174.8094	153.4147	148.5292	156.7911	161.1075	184.5430	202.1803	230.1891	(45)
Energy content (annual)										Total = Sum(45)m =		2250.4717	
Distribution loss (46)m = 0.15 x (45)m													
	35.0160	30.8113	32.3722	27.6366	26.2214	23.0122	22.2794	23.5187	24.1661	27.6815	30.3271	34.5284	(46)
Water storage loss:													
Store volume												210.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5800	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8532	(55)
Total storage loss													
	26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(56)
If cylinder contains dedicated solar storage													
	26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	283.1519	250.3096	265.5259	232.3519	224.5210	201.5227	198.2408	206.5027	209.2155	234.2546	250.2883	279.9007	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	283.1519	250.3096	265.5259	232.3519	224.5210	201.5227	198.2408	206.5027	209.2155	234.2546	250.2883	279.9007	(64)
										Total per year (kWh/year) = Sum(64)m =		2835.7857	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	117.3882	104.2191	111.5276	99.7475	97.8934	89.4968	89.1552	91.9023	92.0546	101.1298	105.7114	116.3071	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	41.4288	36.7967	29.9251	22.6552	16.9351	14.2973	15.4487	20.0808	26.9524	34.2223	39.9425	42.5803	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	426.1571	430.5793	419.4356	395.7119	365.7649	337.6190	318.8159	314.3937	325.5374	349.2611	379.2081	407.3540	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	(71)
Water heating gains (Table 5)													
	157.7798	155.0879	149.9026	138.5382	131.5771	124.3011	119.8323	123.5246	127.8537	135.9272	146.8213	156.3268	(72)
Total internal gains													
	737.7002	734.7984	711.5977	669.2397	626.6115	588.5518	566.4313	570.3336	592.6779	631.7451	678.3063	718.5954	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	2.9800	8.9975	0.3000	0.0000	0.7700	6.1937	(74)
East	5.8000	16.6187	0.3000	0.0000	0.7700	22.2657	(76)
West	2.8100	16.6187	0.3000	0.0000	0.7700	10.7874	(80)

Solar gains	39.2468	80.3587	140.2636	211.3706	257.6519	271.0516	252.0060	210.1168	165.8142	99.1937	50.7382	34.5849	(83)
Total gains	776.9469	815.1570	851.8613	880.6103	884.2634	859.6034	818.4372	780.4504	758.4922	730.9388	729.0445	753.1804	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	28.2376	28.4125	28.4125	29.1343	28.9504	29.8937	30.2884	30.2884	29.8937	29.1343	29.1343	28.9504	
alpha	2.8825	2.8942	2.8942	2.9423	2.9300	2.9929	3.0192	3.0192	2.9929	2.9423	2.9423	2.9300	
util living area													
	0.9198	0.9037	0.8734	0.8026	0.6936	0.5407	0.4323	0.4591	0.6519	0.8183	0.8932	0.9245	(86)
Living	19.2000	19.3960	19.7101	20.2287	20.6232	20.8770	20.9523	20.9426	20.7631	20.2850	19.7220	19.2058	
Non living	18.6269	18.8218	19.1285	19.6404	20.0047	20.2423	20.3079	20.3016	20.1502	19.7002	19.1560	18.6444	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.0792	19.3960	19.7101	20.2287	20.6232	20.8770	20.9523	20.9426	20.7631	20.2850	19.7220	19.4568	(87)
Th 2	20.2901	20.2942	20.2942	20.3105	20.3064	20.3269	20.3351	20.3351	20.3269	20.3105	20.3105	20.3064	(88)
util rest of house													
	0.9120	0.8942	0.8607	0.7820	0.6599	0.4921	0.3738	0.3995	0.6088	0.7956	0.8814	0.9171	(89)
MIT 2	19.4392	18.8218	19.1285	19.6404	20.0047	20.2423	20.3079	20.3016	20.1502	19.7002	19.1560	18.8769	(90)
Living area fraction										fLA = Living area / (4) =		0.2917	(91)
MIT	19.6259	18.9893	19.2982	19.8120	20.1851	20.4275	20.4959	20.4886	20.3290	19.8708	19.3211	19.0461	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6259	18.9893	19.2982	19.8120	20.1851	20.4275	20.4959	20.4886	20.3290	19.8708	19.3211	19.0461	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9037	0.8735	0.8399	0.7657	0.6536	0.4996	0.3883	0.4136	0.6090	0.7794	0.8615	0.9012	(94)
Useful gains	702.1003	712.0245	715.4670	674.2577	577.9645	429.4440	317.7805	322.8129	461.8984	569.7168	628.0445	678.7800	(95)
Ext temp.	4.7000	5.3000	6.7000	9.3000	12.3000	15.0000	16.6000	16.5000	14.1000	10.8000	7.5000	4.6000	(96)
Heat loss rate W													
	1359.9414	1239.5895	1140.7882	928.2979	700.7434	467.1153	330.9326	338.8079	536.0984	801.0311	1043.8999	1283.8116	(97)

Space heating kWh

489.4337	354.5237	316.4390	182.9089	91.3475	0.0000	0.0000	0.0000	0.0000	172.0979	299.4158	450.1435	(98a)

Space heating requirement - total per year (kWh/year) 2356.3100

Solar heating kWh

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)

Solar heating contribution - total per year (kWh/year) 0.0000

Space heating kWh

489.4337	354.5237	316.4390	182.9089	91.3475	0.0000	0.0000	0.0000	0.0000	172.0979	299.4158	450.1435	(98c)

Space heating requirement after solar contribution - total per year (kWh/year) 2356.3100

Space heating per m2 (98c) / (4) = 19.5967 (99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (201)

Fraction of space heat from main system(s) 1.0000 (202)

Efficiency of main space heating system 1 (in %) 280.9756 (206)

Efficiency of main space heating system 2 (in %) 0.0000 (207)

Efficiency of secondary/supplementary heating system, % 0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	489.4337	354.5237	316.4390	182.9089	91.3475	0.0000	0.0000	0.0000	0.0000	172.0979	299.4158	450.1435	(98)
Space heating efficiency (main heating system 1)													
	280.9756	280.9756	280.9756	280.9756	280.9756	0.0000	0.0000	0.0000	0.0000	280.9756	280.9756	280.9756	(210)
Space heating fuel (main heating system)													
	174.1908	126.1760	112.6215	65.0978	32.5108	0.0000	0.0000	0.0000	0.0000	61.2501	106.5629	160.2073	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	283.1519	250.3096	265.5259	232.3519	224.5210	201.5227	198.2408	206.5027	209.2155	234.2546	250.2883	279.9007	(64)
Efficiency of water heater												279.7150	(216)
(217)m	279.7150	279.7150	279.7150	279.7150	279.7150	279.7150	279.7150	279.7150	279.7150	279.7150	279.7150	279.7150	(217)
Fuel for water heating, kWh/month													
	101.2287	89.4874	94.9273	83.0674	80.2678	72.0457	70.8724	73.8261	74.7960	83.7476	89.4798	100.0664	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	45.0156	40.6593	45.0156	43.5635	45.0156	43.5635	45.0156	45.0156	43.5635	45.0156	43.5635	45.0156	(231)
Lighting	36.2624	29.0911	26.1933	19.1903	14.8232	12.1106	13.5222	17.5766	22.8303	29.9546	33.8337	37.2703	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year

Space heating fuel - main system 1 838.6174 (211)

Space heating fuel - main system 2 0.0000 (213)

Space heating fuel - secondary 0.0000 (215)

Efficiency of water heater 279.7150

Water heating fuel used 1013.8127 (219)

Space cooling fuel 0.0000 (221)

Electricity for pumps and fans:

(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.3580)

mechanical ventilation fans (SFP = 1.3580) 530.0227 (230a)

Total electricity for the above, kWh/year 530.0227 (231)

Electricity for lighting (calculated in Appendix L) 292.6585 (232)

Energy saving/generation technologies (Appendices M ,N and Q)

PV generation 0.0000 (233)

Wind generation 0.0000 (234)

Hydro-electric generation (Appendix N) 0.0000 (235a)

Electricity generated - Micro CHP (Appendix N) 0.0000 (235)

Appendix Q - special features

Energy saved or generated -0.0000 (236)

Energy used 0.0000 (237)

Total delivered energy for all uses 2675.1113 (238)

10a. Fuel costs - using BEDF prices (583)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	838.6174	28.4300	238.4189	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1013.8127	28.4300	288.2269	(247)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(247a)
Pumps, fans and electric keep-hot	530.0227	28.4300	150.6855	(249)
Energy for lighting	292.6585	28.4300	83.2028	(250)
Additional standing charges			0.0000	(251)
Total energy cost			760.5341	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	838.6174	0.1550	129.9476	(261)

Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1013.8127	0.1410	142.9340	(264)
Space and water heating			272.8816	(265)
Pumps, fans and electric keep-hot	530.0227	0.1387	73.5207	(267)
Energy for lighting	292.6585	0.1443	42.2397	(268)
Total CO2, kg/year			388.6420	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	838.6174	1.5737	1319.7037	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1013.8127	1.5213	1542.3353	(278)
Space and water heating			2862.0390	(279)
Pumps, fans and electric keep-hot	530.0227	1.5128	801.8183	(281)
Energy for lighting	292.6585	1.5338	448.8894	(282)
Total Primary energy kWh/year			4112.7467	(286)

SAP 10 EPC IMPROVEMENTS

001

Current energy efficiency rating: B 84
Current environmental impact rating: A 97

N Solar water heating		Recommended
U Solar photovoltaic panels		Recommended
V2 Wind turbine		Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
N Solar water heating	+ 1.2	-£ 54	-23 kg (6.0%)
U Solar photovoltaic panels	+ 6.9	-£ 289	-207 kg (56.6%)

	Typical annual savings		Energy efficiency	Environmental impact
Recommended measures				
Solar water heating	£54	0.19 kg/m²	B 85	A 97
Solar photovoltaic panels	£289	1.72 kg/m²	A 92	A 99
Total Savings	£342	1.91 kg/m²		

Potential energy efficiency rating: A 92
Potential environmental impact rating: A 99

Fuel prices for cost data on this page from database revision number 583 TEST (01 Oct 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, West Pennines (England)):

	Current	Potential	Saving
Electricity	£761	£707	£54
Space heating	£389	£415	-£26
Water heating	£288	£209	£79
Lighting	£83	£83	£0
Generated (PV)	-£0	-£289	£289
Total cost of fuels	£761	£418	£343
Total cost of uses	£760	£418	£342
Delivered energy	22 kWh/m²	7 kWh/m²	15 kWh/m²
Carbon dioxide emissions	0.4 tonnes	0.2 tonnes	0.2 tonnes
CO2 emissions per m²	3 kg/m²	1 kg/m²	2 kg/m²
Primary energy	34 kWh/m²	18 kWh/m²	16 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

Main dwelling	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	47.0600 (1b)	x	2.4800 (2b)	=	116.7088 (1b) - (3b)	
First floor	49.7800 (1c)	x	2.7800 (2c)	=	138.3884 (1c) - (3c)	
Second floor	23.4000 (1d)	x	2.7700 (2d)	=	64.8180 (1d) - (3d)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	120.2400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	319.9152	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)

Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.2500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2125	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2709	0.2656	0.2603	0.2338	0.2284	0.2019	0.2019	0.1966	0.2125	0.2284	0.2391	0.2497	(22b)

Balanced mechanical ventilation with heat recovery		
If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =		80.1000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.3704	0.3651	0.3598	0.3332	0.3279	0.3014	0.3014	0.2961	0.3120	0.3279	0.3386	0.3492	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Door			4.1400	1.0000	4.1400			(26)
Window			11.5900	0.7752	8.9845			(27)
GF			47.0600	0.0900	4.2354	75.0000	3529.5000	(28a)
Exposed Floor			2.7200	0.1400	0.3808	20.0000	54.4000	(28b)
Main	129.1100	15.7300	113.3800	0.1300	14.7394	9.0000	1020.4200	(29a)
Dwarf Wall (PIRx0.72)	16.7700		16.7700	0.0900	1.5093	9.0000	150.9300	(29a)
PIJ	15.5100		15.5100	0.1300	2.0163	9.0000	139.5900	(30)
PIR	17.5400		17.5400	0.1300	2.2802	9.0000	157.8600	(30)
Residual Ceiling	26.3800		26.3800	0.0900	2.3742	9.0000	237.4200	(30)
Total net area of external elements Aum(A, m2)			255.0900					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		40.6601			(33)
Main dwelling								
Party Wall 1			47.6000	0.0000	0.0000	20.0000	952.0000	(32)
Timber			124.1700			9.0000	1117.5300	(32c)
FF			47.0600			18.0000	847.0800	(32d)
SF			23.4000			18.0000	421.2000	(32d)
GF			47.0600			9.0000	423.5400	(32e)
FF			23.4000			9.0000	210.6000	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	9262.0700 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		77.0299 (35)

List of Thermal Bridges	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	10.6900	0.1150	1.2293
E3 Sill	10.6900	0.0170	0.1817
E4 Jamb	37.2000	0.0940	3.4968
E5 Ground floor (normal)	20.0500	0.0670	1.3434
E11 Eaves (insulation at rafter level)	18.1000	0.0250	0.4525
E16 Corner (normal)	24.0800	0.0680	1.6374
E12 Gable (insulation at ceiling level)	5.6600	0.0770	0.4358
E6 Intermediate floor within a dwelling	39.5500	0.0320	1.2656
E17 Corner (inverted - internal area greater than external area)	2.4800	-0.0290	-0.0719
P1 Party wall - Ground floor	9.0500	0.3200	2.8960
E20 Exposed floor (normal)	3.3800	0.0790	0.2670
E21 Exposed floor (inverted)	3.3800	0.0630	0.2129
E13 Gable (insulation at rafter level)	8.2800	0.0740	0.6127
E18 Party wall between dwellings	10.5200	0.0920	0.9678
R6 Flat ceiling	18.1000	-0.0430	-0.7783

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		14.1489 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	54.8090 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	39.1078	38.5470	37.9861	35.1819	34.6210	31.8168	31.8168	31.2559	32.9385	34.6210	35.7427	36.8644	(38)
Heat transfer coeff	93.9168	93.3560	92.7951	89.9909	89.4300	86.6258	86.6258	86.0649	87.7475	89.4300	90.5517	91.6734	(39)
Average = Sum(39)m / 12 =												89.8506	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7811	0.7764	0.7717	0.7484	0.7438	0.7204	0.7204	0.7158	0.7298	0.7438	0.7531	0.7624	(40)
HLP (average)												0.7473	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.8642 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	72.2437	71.1580	69.5759	66.5490	64.3151	61.8240	60.4080	61.9781	63.6992	66.3739	69.4659	71.9669	(42a)
Hot water usage for baths	31.1904	30.7271	30.0748	28.8721	27.9715	26.9729	26.4334	27.0812	27.7865	28.8550	30.0826	31.0849	(42b)
Hot water usage for other uses	43.9627	42.3640	40.7654	39.1667	37.5681	35.9694	35.9694	37.5681	39.1667	40.7654	42.3640	43.9627	(42c)
Average daily hot water use (litres/day)												135.4907	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	147.3967	144.2491	140.4161	134.5878	129.8547	124.7663	122.8109	126.6274	130.6524	135.9943	141.9125	147.0144	(44)
Energy conte	233.4403	205.4088	215.8143	184.2439	174.8094	153.4147	148.5292	156.7911	161.1075	184.5430	202.1803	230.1891	(45)
Energy content (annual)										Total = Sum(45)m =		2250.4717	

Distribution loss (46)m = 0.15 x (45)m

	35.0160	30.8113	32.3722	27.6366	26.2214	23.0122	22.2794	23.5187	24.1661	27.6815	30.3271	34.5284 (46)

Water storage loss:

Store volume	210.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):	1.5800 (48)
Temperature factor from Table 2b	0.5400 (49)
Enter (49) or (54) in (55)	0.8532 (55)

Total storage loss

	26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492 (56)

If cylinder contains dedicated solar storage

	17.0031	15.3576	17.0031	16.4546	17.0031	16.4546	17.0031	17.0031	16.4546	17.0031	16.4546	17.0031 (57)
Primary loss	23.2624	21.0112	21.8667	15.7584	10.4681	9.9053	10.2355	11.1660	17.1091	21.8667	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)

Total heat required for water heating calculated for each month

	273.7058	241.7776	254.6841	216.4569	202.2805	179.7746	175.7677	184.9602	194.6712	223.4127	241.1469	270.4545 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)

Aperture area of solar collector	3.0000 (H1)
Zero-loss collector efficiency	0.8000 (H2)
Collector linear heat loss coefficient	1.8000 (H3)
Collector 2nd order heat loss coefficient	0.0000 (H4)
Collector loop efficiency	0.9000 (H5)
Incidence angle modifier	1.0000 (H6)
Overshading factor	0.8000 (H8)
Overall heat loss coefficient of system	6.5000 (H10)
Heat loss coefficient of collector loop	3.9667 (H11)
Dedicated solar storage volume	75.0000 (H12)
If combined cylinder, total volume of cylinder	210.0000 (H13)
Effective solar volume	115.5000 (H14)
Reference volume	225.0000 (H15)
Storage tank correction coefficient	1.1814 (H16)
Heat delivered to hot water	661.7243 (H24)
Heat delivered to space heating	0.0000 (H29)
Solar input	661.7243

Solar input	-0.0000	-20.2144	-62.8139	-84.6635	-109.0628	-100.4582	-99.7212	-87.9174	-62.1691	-33.3828	-1.3210	-0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)

Output from w/h

	273.7058	221.5632	191.8702	131.7934	93.2177	79.3164	76.0465	97.0428	132.5020	190.0299	239.8259	270.4545 (64)

Total per year (kWh/year) = Sum(64)m = 1997.3683 (64)

Electric shower(s)

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

	109.8313	97.3935	102.8540	87.0315	80.1010	72.0983	71.1768	74.6683	80.4192	92.4563	98.3982	108.7502 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	41.4288	36.7967	29.9251	22.6552	16.9351	14.2973	15.4487	20.0808	26.9524	34.2223	39.9425	42.5803 (67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	426.1571	430.5793	419.4356	395.7119	365.7649	337.6190	318.8159	314.3937	325.5374	349.2611	379.2081	407.3540 (68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)

Losses e.g. evaporation (negative values) (Table 5)

	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695 (71)

Water heating gains (Table 5)

	147.6227	144.9308	138.2447	120.8771	107.6627	100.1365	95.6677	100.3606	111.6933	124.2693	136.6642	146.1697 (72)

Total internal gains

	727.5430	724.6412	699.9398	651.5785	602.6971	564.3872	542.2667	547.1695	576.5176	620.0871	668.1492	708.4383 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	2.9800	10.6334	0.3000	0.0000	0.7700	7.3198	(74)
East	5.8000	19.6403	0.3000	0.0000	0.7700	26.3140	(76)
West	2.8100	19.6403	0.3000	0.0000	0.7700	12.7487	(80)

Solar gains	46.3825	90.4035	149.6145	221.7174	276.3640	285.3175	270.6200	229.0857	174.9416	107.3243	57.7365	38.2254	(83)
Total gains	773.9256	815.0447	849.5543	873.2960	879.0611	849.7047	812.8867	776.2552	751.4592	727.4114	725.8857	746.6637	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	27.3944	27.5590	27.7256	28.5895	28.7688	29.7001	29.7001	29.8937	29.3205	28.7688	28.4125	28.0648	
alpha	2.8263	2.8373	2.8484	2.9060	2.9179	2.9800	2.9800	2.9929	2.9547	2.9179	2.8942	2.8710	
util living area	0.9263	0.9109	0.8801	0.8195	0.7238	0.5747	0.4415	0.4743	0.6618	0.8279	0.9025	0.9314	(86)
Living	19.0324	19.2386	19.6125	20.1241	20.5403	20.8429	20.9470	20.9339	20.7439	20.2290	19.5868	19.0310	
Non living	18.4476	18.6528	19.0218	19.5315	19.9262	20.2111	20.2926	20.2877	20.1235	19.6410	19.0122	18.4578	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	19.9935	19.2386	19.6125	20.1241	20.5403	20.8429	20.9470	20.9339	20.7439	20.2290	19.5868	19.3064	(87)
Th 2	20.2698	20.2738	20.2779	20.2983	20.3023	20.3228	20.3228	20.3269	20.3146	20.3023	20.2942	20.2860	(88)
util rest of house	0.9190	0.9021	0.8679	0.8004	0.6932	0.5282	0.3811	0.4142	0.6183	0.8063	0.8917	0.9246	(89)
MIT 2	19.3376	18.6528	19.0218	19.5315	19.9262	20.2111	20.2926	20.2877	20.1235	19.6410	19.0122	18.7135	(90)
Living area fraction									fLA = Living area / (4) =			0.2917	(91)
MIT	19.5290	18.8237	19.1941	19.7044	20.1054	20.3954	20.4835	20.4762	20.3045	19.8125	19.1798	18.8865	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5290	18.8237	19.1941	19.7044	20.1054	20.3954	20.4835	20.4762	20.3045	19.8125	19.1798	18.8865	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9106	0.8809	0.8464	0.7825	0.6839	0.5334	0.3958	0.4279	0.6176	0.7891	0.8713	0.9087	(94)
Useful gains	704.7218	718.0071	719.1047	683.3198	601.2165	453.2060	321.7505	332.1911	464.0899	574.0198	632.4348	678.4967	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1430.2546	1299.8618	1177.9547	972.2965	751.6906	502.0343	336.4140	350.8212	544.4279	823.8772	1093.8476	1346.3611	(97)
Space heating kWh													
	539.7964	391.0064	341.3844	208.0632	111.9528	0.0000	0.0000	0.0000	0.0000	185.8939	332.2172	496.8911	(98a)
Space heating requirement - total per year (kWh/year)												2607.2054	
Solar heating kWh													
	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	539.7964	391.0064	341.3844	208.0632	111.9528	0.0000	0.0000	0.0000	0.0000	185.8939	332.2172	496.8911	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2607.2054	
Space heating per m2											(98c) / (4) =	21.6833	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	281.8222	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	539.7964	391.0064	341.3844	208.0632	111.9528	0.0000	0.0000	0.0000	0.0000	185.8939	332.2172	496.8911	(98)
Space heating efficiency (main heating system 1)													
	281.8222	281.8222	281.8222	281.8222	281.8222	0.0000	0.0000	0.0000	0.0000	281.8222	281.8222	281.8222	(210)
Space heating fuel (main heating system)													
	191.5379	138.7422	121.1347	73.8278	39.7246	0.0000	0.0000	0.0000	0.0000	65.9614	117.8818	176.3137	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	273.7058	221.5632	191.8702	131.7934	93.2177	79.3164	76.0465	97.0428	132.5020	190.0299	239.8259	270.4545	(64)
Efficiency of water heater												279.7068	(216)
(217)m	279.7068	279.7068	279.7068	279.7068	279.7068	279.7068	279.7068	279.7068	279.7068	279.7068	279.7068	279.7068	(217)
Fuel for water heating, kWh/month													
	97.8545	79.2127	68.5969	47.1184	33.3270	28.3570	27.1879	34.6945	47.3718	67.9390	85.7419	96.6922	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	51.8101	46.7963	51.8101	50.1389	51.8101	50.1389	51.8101	51.8101	50.1389	51.8101	50.1389	51.8101	(231)
Lighting	36.2624	29.0911	26.1933	19.1903	14.8232	12.1106	13.5222	17.5766	22.8303	29.9546	33.8337	37.2703	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-38.4498	-57.4336	-86.9295	-101.3748	-110.7580	-101.0361	-99.8555	-93.0523	-80.9287	-66.7984	-43.0965	-32.7525	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-11.6367	-26.1464	-55.4168	-89.3972	-124.9248	-130.6776	-128.7960	-106.7217	-75.5344	-40.0475	-16.3133	-9.1614	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	925.1242	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	279.7068	
Water heating fuel used	714.0937	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.3580)		
mechanical ventilation fans (SFP = 1.3580)	530.0227	(230a)
pump for solar water heating	80.0000	(230g)
Total electricity for the above, kWh/year	610.0227	(231)
Electricity for lighting (calculated in Appendix L)	292.6585	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1727.2394	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	814.6597	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	925.1242	16.4900	152.5530	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	714.0937	16.4900	117.7541	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)

Pumps, fans and electric keep-hot	530.0227	16.4900	87.4007	(249)
Pump for solar water heating	80.0000	16.4900	13.1920	(249)
Energy for lighting	292.6585	16.4900	48.2594	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-912.4656	16.4900	-150.4656	
PV Unit electricity exported	-814.7738	5.5900	-45.5459	
Total			-196.0114	(252)
Total energy cost			223.1477	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.4862	(257)
SAP value		92.1193	
SAP rating (Section 12)		92	(258)
SAP band		A	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	925.1242	0.1549	143.2641	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	714.0937	0.1460	104.2901	(264)
Space and water heating			247.5542	(265)
Pumps, fans and electric keep-hot	610.0227	0.1387	84.6177	(267)
Energy for lighting	292.6585	0.1443	42.2397	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-912.4656	0.1340	-122.3078	
PV Unit electricity exported	-814.7738	0.1237	-100.7629	
Total			-223.0707	(269)
Total CO2, kg/year			151.3409	(272)
CO2 emissions per m2			1.2600	(273)
EI value			98.7727	
EI rating			99	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

Main dwelling	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	47.0600	(1b) x	2.4800	(2b) =	116.7088	(1b) - (3b)
First floor	49.7800	(1c) x	2.7800	(2c) =	138.3884	(1c) - (3c)
Second floor	23.4000	(1d) x	2.7700	(2d) =	64.8180	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	120.2400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		319.9152	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.2500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2125	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.6000	4.5000	4.5000	4.1000	4.2000	3.7000	3.5000	3.5000	3.7000	4.1000	4.1000	4.2000	(22)
Wind factor	1.1500	1.1250	1.1250	1.0250	1.0500	0.9250	0.8750	0.8750	0.9250	1.0250	1.0250	1.0500	(22a)
Adj infilt rate	0.2444	0.2391	0.2391	0.2178	0.2231	0.1966	0.1859	0.1859	0.1966	0.2178	0.2178	0.2231	(22b)

Balanced mechanical ventilation with heat recovery		
If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =		80.1000 (23c)

Effective ac	0.3439	0.3386	0.3386	0.3173	0.3226	0.2961	0.2854	0.2854	0.2961	0.3173	0.3173	0.3226 (25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Door			4.1400	1.0000	4.1400			(26)
Window			11.5900	0.7752	8.9845			(27)
GF			47.0600	0.0900	4.2354	75.0000	3529.5000	(28a)
Exposed Floor			2.7200	0.1400	0.3808	20.0000	54.4000	(28b)
Main	129.1100	15.7300	113.3800	0.1300	14.7394	9.0000	1020.4200	(29a)
Dwarf Wall (PIRx0.72)	16.7700		16.7700	0.0900	1.5093	9.0000	150.9300	(29a)
PIJ	15.5100		15.5100	0.1300	2.0163	9.0000	139.5900	(30)
PIR	17.5400		17.5400	0.1300	2.2802	9.0000	157.8600	(30)
Residual Ceiling	26.3800		26.3800	0.0900	2.3742	9.0000	237.4200	(30)
Total net area of external elements Aum(A, m2)			255.0900					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		40.6601			(33)
Main dwelling								
Party Wall 1			47.6000	0.0000	0.0000	20.0000	952.0000	(32)
Timber			124.1700			9.0000	1117.5300	(32c)
FF			47.0600			18.0000	847.0800	(32d)
SF			23.4000			18.0000	421.2000	(32d)
GF			47.0600			9.0000	423.5400	(32e)
FF			23.4000			9.0000	210.6000	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	9262.0700 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		77.0299 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	10.6900	0.1150	1.2293
E3 Sill	10.6900	0.0170	0.1817
E4 Jamb	37.2000	0.0940	3.4968
E5 Ground floor (normal)	20.0500	0.0670	1.3434
E11 Eaves (insulation at rafter level)	18.1000	0.0250	0.4525
E16 Corner (normal)	24.0800	0.0680	1.6374
E12 Gable (insulation at ceiling level)	5.6600	0.0770	0.4358
E6 Intermediate floor within a dwelling	39.5500	0.0320	1.2656
E17 Corner (inverted - internal area greater than external area)	2.4800	-0.0290	-0.0719
P1 Party wall - Ground floor	9.0500	0.3200	2.8960
E20 Exposed floor (normal)	3.3800	0.0790	0.2670
E21 Exposed floor (inverted)	3.3800	0.0630	0.2129
E13 Gable (insulation at rafter level)	8.2800	0.0740	0.6127
E18 Party wall between dwellings	10.5200	0.0920	0.9678
R6 Flat ceiling	18.1000	-0.0430	-0.7783

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		14.1489 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	54.8090 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	36.3036	35.7427	35.7427	33.4993	34.0602	31.2559	30.1342	30.1342	31.2559	33.4993	33.4993	34.0602	(38)
Heat transfer coeff	91.1126	90.5517	90.5517	88.3083	88.8692	86.0649	84.9432	84.9432	86.0649	88.3083	88.3083	88.8692	(39)
Average = Sum(39)m / 12 =												88.0746	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7578	0.7531	0.7531	0.7344	0.7391	0.7158	0.7064	0.7064	0.7158	0.7344	0.7344	0.7391	(40)
HLP (average)												0.7325	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.8642	(42)
Hot water usage for mixer showers	72.2437	71.1580	69.5759	66.5490	64.3151	61.8240	60.4080	61.9781	63.6992	66.3739	69.4659	71.9669	(42a)
Hot water usage for baths	31.1904	30.7271	30.0748	28.8721	27.9715	26.9729	26.4334	27.0812	27.7865	28.8550	30.0826	31.0849	(42b)
Hot water usage for other uses	43.9627	42.3640	40.7654	39.1667	37.5681	35.9694	35.9694	37.5681	39.1667	40.7654	42.3640	43.9627	(42c)
Average daily hot water use (litres/day)												135.4907	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	147.3967	144.2491	140.4161	134.5878	129.8547	124.7663	122.8109	126.6274	130.6524	135.9943	141.9125	147.0144	(44)
Energy conte	233.4403	205.4088	215.8143	184.2439	174.8094	153.4147	148.5292	156.7911	161.1075	184.5430	202.1803	230.1891	(45)
Energy content (annual)										Total = Sum(45)m =		2250.4717	
Distribution loss (46)m = 0.15 x (45)m	35.0160	30.8113	32.3722	27.6366	26.2214	23.0122	22.2794	23.5187	24.1661	27.6815	30.3271	34.5284	(46)
Water storage loss:													
Store volume												210.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5800	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8532	(55)
Total storage loss	26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(56)
If cylinder contains dedicated solar storage	17.0031	15.3576	17.0031	16.4546	17.0031	16.4546	17.0031	17.0031	16.4546	17.0031	16.4546	17.0031	(57)
Primary loss	23.2624	21.0112	21.8667	15.7584	10.4681	9.9053	10.2355	11.1660	17.1091	21.8667	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	273.7058	241.7776	254.6841	216.4569	202.2805	179.7746	175.7677	184.9602	194.6712	223.4127	241.1469	270.4545	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Aperture area of solar collector												3.0000	(H1)
Zero-loss collector efficiency												0.8000	(H2)
Collector linear heat loss coefficient												1.8000	(H3)
Collector 2nd order heat loss coefficient												0.0000	(H4)
Collector loop efficiency												0.9000	(H5)
Incidence angle modifier												1.0000	(H6)
Overshading factor												0.8000	(H8)
Overall heat loss coefficient of system												6.5000	(H10)
Heat loss coefficient of collector loop												3.9667	(H11)
Dedicated solar storage volume												75.0000	(H12)
If combined cylinder, total volume of cylinder												210.0000	(H13)

Effective solar volume												115.5000	(H14)
Reference volume												225.0000	(H15)
Storage tank correction coefficient												1.1814	(H16)
Heat delivered to hot water												605.2985	(H24)
Heat delivered to space heating												0.0000	(H29)
Solar input												605.2985	
Solar input	-0.0000	-14.4753	-57.1346	-80.0537	-101.5431	-95.3649	-92.1367	-79.1730	-57.3788	-28.0385	-0.0000	-0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	273.7058	227.3023	197.5495	136.4032	100.7374	84.4097	83.6309	105.7872	137.2924	195.3743	241.1469	270.4545	(64)
									Total per year (kWh/year) = Sum(64)m =			2053.7941	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month													
	109.8313	97.3935	102.8540	87.0315	80.1010	72.0983	71.1768	74.6683	80.4192	92.4563	98.3982	108.7502	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	41.4288	36.7967	29.9251	22.6552	16.9351	14.2973	15.4487	20.0808	26.9524	34.2223	39.9425	42.5803	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	426.1571	430.5793	419.4356	395.7119	365.7649	337.6190	318.8159	314.3937	325.5374	349.2611	379.2081	407.3540	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	(71)
Water heating gains (Table 5)													
	147.6227	144.9308	138.2447	120.8771	107.6627	100.1365	95.6677	100.3606	111.6933	124.2693	136.6642	146.1697	(72)
Total internal gains													
	727.5430	724.6412	699.9398	651.5785	602.6971	564.3872	542.2667	547.1695	576.5176	620.0871	668.1492	708.4383	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	2.9800	8.9975	0.3000	0.0000	0.7700	6.1937	(74)
East	5.8000	16.6187	0.3000	0.0000	0.7700	22.2657	(76)
West	2.8100	16.6187	0.3000	0.0000	0.7700	10.7874	(80)

Solar gains	39.2468	80.3587	140.2636	211.3706	257.6519	271.0516	252.0060	210.1168	165.8142	99.1937	50.7382	34.5849	(83)
Total gains	766.7898	804.9999	840.2034	862.9492	860.3489	835.4388	794.2726	757.2863	742.3318	719.2808	718.8873	743.0232	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	28.2376	28.4125	28.4125	29.1343	28.9504	29.8937	30.2884	30.2884	29.8937	29.1343	29.1343	28.9504	
alpha	2.8825	2.8942	2.8942	2.9423	2.9300	2.9929	3.0192	3.0192	2.9929	2.9423	2.9423	2.9300	
util living area													
	0.9221	0.9061	0.8767	0.8091	0.7045	0.5526	0.4437	0.4709	0.6609	0.8233	0.8962	0.9267	(86)
Living	19.1821	19.3791	19.6928	20.2086	20.6062	20.8695	20.9489	20.9385	20.7538	20.2710	19.7056	19.1875	
Non living	18.6095	18.8055	19.1120	19.6219	19.9902	20.2369	20.3058	20.2991	20.1428	19.6874	19.1403	18.6266	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.0700	19.3791	19.6928	20.2086	20.6062	20.8695	20.9489	20.9385	20.7538	20.2710	19.7056	19.4411	(87)
Th 2	20.2901	20.2942	20.2942	20.3105	20.3064	20.3269	20.3351	20.3351	20.3269	20.3105	20.3105	20.3064	(88)
util rest of house													
	0.9144	0.8969	0.8642	0.7890	0.6711	0.5036	0.3840	0.4103	0.6179	0.8010	0.8847	0.9195	(89)
MIT 2	19.4304	18.8055	19.1120	19.6219	19.9902	20.2369	20.3058	20.2991	20.1428	19.6874	19.1403	18.8616	(90)
Living area fraction										fLA = Living area / (4) =		0.2917	(91)
MIT	19.6170	18.9728	19.2815	19.7931	20.1699	20.4214	20.4934	20.4857	20.3211	19.8577	19.3053	19.0307	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6170	18.9728	19.2815	19.7931	20.1699	20.4214	20.4934	20.4857	20.3211	19.8577	19.3053	19.0307	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9061	0.8762	0.8434	0.7723	0.6641	0.5107	0.3986	0.4244	0.6175	0.7845	0.8648	0.9037	(94)
Useful gains	694.8029	705.3516	708.6421	666.4249	571.3384	426.6568	316.6027	321.4102	458.3965	564.2777	621.6651	671.5003	(95)
Ext temp.	4.7000	5.3000	6.7000	9.3000	12.3000	15.0000	16.6000	16.5000	14.1000	10.8000	7.5000	4.6000	(96)
Heat loss rate W													
	1359.1257	1238.0994	1139.2722	926.6284	699.3924	466.5948	330.7209	338.5542	535.4149	799.8663	1042.5022	1282.4409	(97)
Space heating kWh													
	494.2561	358.0066	320.3888	187.3465	95.2722	0.0000	0.0000	0.0000	0.0000	175.2779	303.0027	454.5398	(98a)
Space heating requirement - total per year (kWh/year)												2388.0906	
Solar heating kWh													
	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	494.2561	358.0066	320.3888	187.3465	95.2722	0.0000	0.0000	0.0000	0.0000	175.2779	303.0027	454.5398	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2388.0906	
Space heating per m2											(98c) / (4) =	19.8610	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												280.9756	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	494.2561	358.0066	320.3888	187.3465	95.2722	0.0000	0.0000	0.0000	0.0000	175.2779	303.0027	454.5398	(98)
Space heating efficiency (main heating system 1)													
	280.9756	280.9756	280.9756	280.9756	280.9756	0.0000	0.0000	0.0000	0.0000	280.9756	280.9756	280.9756	(210)
Space heating fuel (main heating system)													
	175.9071	127.4155	114.0273	66.6772	33.9076	0.0000	0.0000	0.0000	0.0000	62.3819	107.8395	161.7720	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	273.7058	227.3023	197.5495	136.4032	100.7374	84.4097	83.6309	105.7872	137.2924	195.3743	241.1469	270.4545	(64)
Efficiency of water heater												279.7150	(216)
(217)m	279.7150	279.7150	279.7150	279.7150	279.7150	279.7150	279.7150	279.7150	279.7150	279.7150	279.7150	279.7150	(217)
Fuel for water heating, kWh/month													
	97.8517	81.2621	70.6253	48.7651	36.0143	30.1770	29.8986	37.8196	49.0830	69.8476	86.2117	96.6893	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	51.8101	46.7963	51.8101	50.1389	51.8101	50.1389	51.8101	51.8101	50.1389	51.8101	50.1389	51.8101	(231)
Lighting	36.2624	29.0911	26.1933	19.1903	14.8232	12.1106	13.5222	17.5766	22.8303	29.9546	33.8337	37.2703	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-33.1541	-52.0360	-82.6384	-97.7818	-105.7513	-98.2768	-96.0863	-88.4991	-78.2017	-62.8437	-38.5582	-29.9222	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-9.2268	-22.2573	-50.8112	-84.0875	-113.9738	-121.8513	-116.8379	-94.7331	-70.0981	-35.9078	-13.6505	-7.9998	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												849.9282	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												279.7150	
Water heating fuel used												734.2454	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.3580)													
mechanical ventilation fans (SFP = 1.3580)												530.0227	(230a)
pump for solar water heating												80.0000	(230g)
Total electricity for the above, kWh/year												610.0227	(231)
Electricity for lighting (calculated in Appendix L)												292.6585	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1605.1846	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												881.6702	(238)

10a. Fuel costs - using BEDF prices (583)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	849.9282	28.4300	241.6346	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	734.2454	28.4300	208.7460	(247)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(247a)
Pumps, fans and electric keep-hot	530.0227	28.4300	150.6855	(249)
Pump for solar water heating	80.0000	28.4300	22.7440	(249)
Energy for lighting	292.6585	28.4300	83.2028	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-863.7495	28.4300	-245.5640	
PV Unit electricity exported	-741.4351	5.8100	-43.0774	
Total			-288.6414	(252)
Total energy cost			418.3714	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	849.9282	0.1549	131.6527	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	734.2454	0.1456	106.9262	(264)
Space and water heating			238.5789	(265)
Pumps, fans and electric keep-hot	610.0227	0.1387	84.6177	(267)
Energy for lighting	292.6585	0.1443	42.2397	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-863.7495	0.1337	-115.4732	

PV Unit electricity exported	-741.4351	0.1234	-91.5218	
Total			-206.9949	(269)
Total CO2, kg/year			158.4414	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	849.9282	1.5735	1337.3263	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	734.2454	1.5387	1129.7741	(278)
Space and water heating			2467.1004	(279)
Pumps, fans and electric keep-hot	610.0227	1.5128	922.8423	(281)
Energy for lighting	292.6585	1.5338	448.8894	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-863.7495	1.4941	-1290.4893	
PV Unit electricity exported	-741.4351	0.4530	-335.8863	
Total			-1626.3756	(283)
Total Primary energy kWh/year			2212.4565	(286)

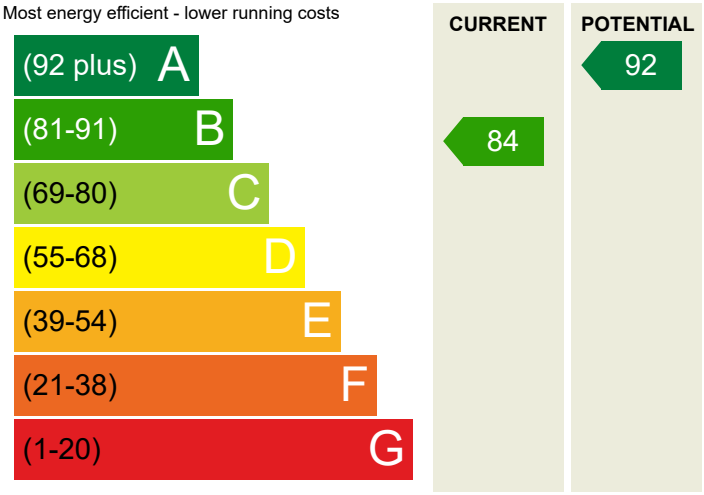
Energy Report

Dwelling Address	854 Rochdale Road, MANCHESTER, M9 8FA
Reference	78449-01-001
Assessment Date	02/07/2025
Submission Date	
Property Type	House, End-Terrace
Total Floor Area	120

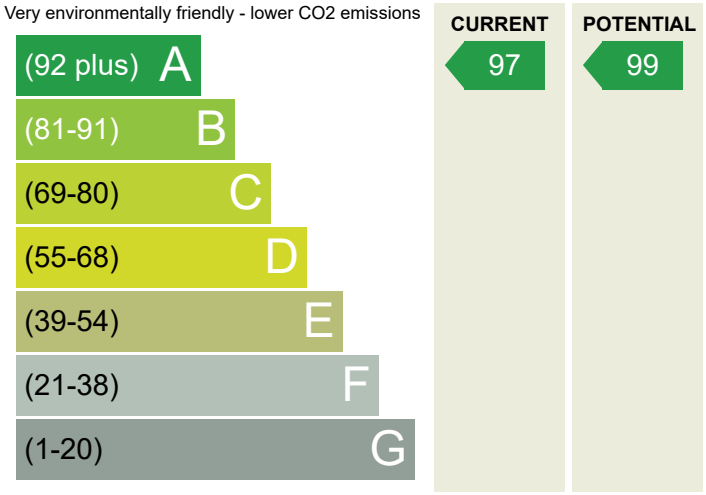
This Energy Report has been generated using the UK's National Calculation Methodology for dwellings, Standard Assessment Procedure (SAP). This methodology is used to assess the energy efficiency of dwellings which is calculated based on a dwelling's heating, hot water, ventilation and lighting usage.

This document is not an Energy Performance Certificate (EPC) as required by the Energy Performance of Buildings Regulations

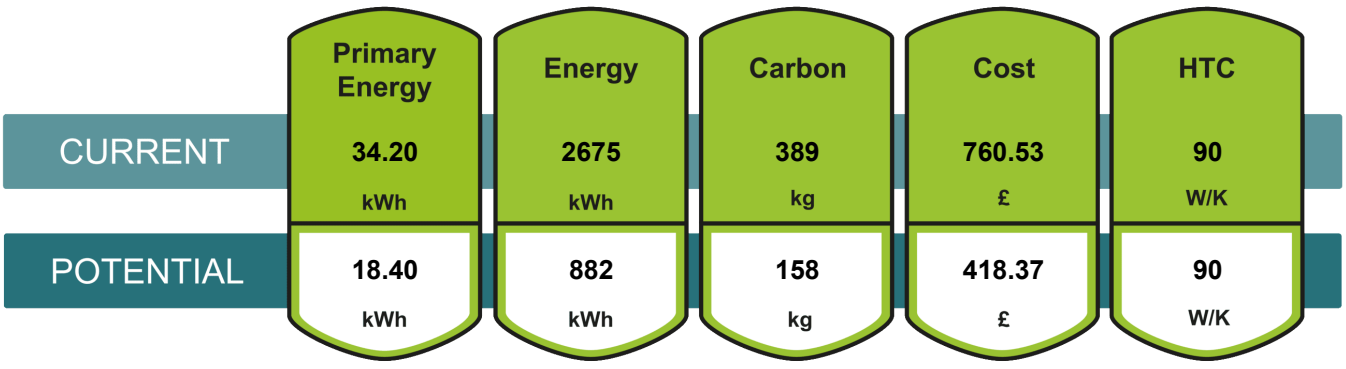
Energy Efficiency Rating



Carbon Dioxide (CO2) Emissions Rating



Additional ratings for your home



Energy Report

Breakdown of property's energy performance

Each feature is assessed as one of the following:

Very Poor | Poor | Average | Good | Very Good

Feature	Description	Energy Performance
Walls	Average thermal transmittance 0.12 W/m²K	Very Good
Roof	Average thermal transmittance 0.11 W/m²K	Very Good
Floor	Average thermal transmittance 0.09 W/m²K	Very Good
Windows	High performance glazing	Very Good
Main heating	Air source heat pump, radiators, electric	Good
Main heating controls	Programmer, room thermostat and TRVs	Good
Secondary heating	None	
Hot water	From main system	Good
Lighting	Good lighting efficiency	Good
Air tightness	Air permeability [AP50] = 5.0 m³/h.m² (as tested)	Good

Recommendations

The recommended measures provided below will help to improve the energy efficiency of the dwelling.
To reach the dwelling's potential energy rating all of the recommended measures shown below would need to be installed.
Having these measures installed individually or in any other order may give a different result when compared with the cumulative potential rating.

Recommended measures	Cumulative savings (per year)	Cumulative rating	Typical costs	Incremental savings (per year)	Cumulative CO2 rating
Solar water heating	£54	B 85	£4,000 - £7,000	£54	A 97
Photovoltaic	£342	A 92	£8,000 - £10,000	£289	A 99

Energy Report

The typical cost is based on average installation prices across the country so may not be representative of the actual costs in your area.

Estimated energy costs of the dwelling

The table below shows the estimated running costs of the space and water heating and lighting within the dwelling. It does not include the energy used from household appliances. The estimated annual costs after potential improvements indicates the total energy cost if all recommended measures named above were installed.

	Estimated annual costs	Estimated annual costs after potential improvements	Potential future savings
Lighting	£83	£83	
Heating	£389	£415	
Hot Water	£288	£209	
New Technologies e.g. Impact of PV	£0	-(£289)	
TOTAL	£761	£418	

Estimated energy use and potential savings

Space Heating
839
kWh per year

Water Heating
1014
kWh per year

Energy Report

About this document

Created by:	
Company/Trading name:	
Phone number:	
Email address:	

Disclaimer

This Energy Report should not under any circumstances be treated as a Condition Survey and cannot be used to indicate that any element of the dwelling (e.g.heating system) is working correctly.
This Energy Report must not be used in situations where an Energy Performance Certificate (EPC) is required.
This Energy Report is generated from a set of data inputs which may not reflect the actual dimensions, services or construction of the dwelling.
The calculation used to generate this report reflects the SAP Methodology current at the time of report generation.

Glossary terms for additional metrics

Primary Energy	The measure of the energy required for lighting, heating and hot water in a property. This includes the efficiency of the property's heating system, power station efficiency for electricity and the energy used to produce the fuel and deliver it to the property.
Energy Used	The estimated amount of fuel energy for lighting, heating and hot water for the property. The estimate is based on typical usage which is likely to be different to actual consumption.
Carbon (CO2)	The current emissions based on the energy estimates.
Cost	The estimated cost of energy. The cost of each unit of fuel is based on an industry standard which is likely to be different to those the occupier actually pays.
Heat Transfer Coefficient	Heat flow through the property envelope where internal and external temperatures are different.

Building Regulations England Part L (BREL) Compliance Report

Approved Document L1 2021 Edition, England assessed by Array SAP 10 program, Array

Date: Fri 03 Oct 2025 15:03:26

Project Information			
Assessed By	Paul Goddard	Building Type	House, Mid-terrace
OCDEA Registration	EES/005113	Assessment Date	2025-10-03

Dwelling Details			
Assessment Type	As built	Total Floor Area	91 m^2
Site Reference	78449-02	Plot Reference	001
Address	852 Rochdale Road, MANCHESTER, M9 8FA		

Client Details	
Name	-
Company	John Southworth
Address	Unit 10, Charles Street, DUKINFIELD, SK16 4SD

This report covers items included within the SAP calculations. It is not a complete report of regulations compliance.

1a Target emission rate and dwelling emission rate		
Fuel for main heating system	Electricity	
Target carbon dioxide emission rate	*11.44 $kgCO_2/m^2$*	
Dwelling carbon dioxide emission rate	3.62 $kgCO_2/m^2$	**OK**
1b Target primary energy rate and dwelling primary energy		
Target primary energy	*59.93 kWh_{PE}/m^2*	
Dwelling primary energy	38.33 kWh_{PE}/m^2	**OK**
1c Target fabric energy efficiency and dwelling fabric energy efficiency		
Target fabric energy efficiency	*36.9 kWh/m^2*	
Dwelling fabric energy efficiency	34.1 kWh/m^2	**OK**

2a Fabric U-values				
Element	***Maximum permitted average U-Value [W/m^2K]***	**Dwelling average U-Value [W/m^2K]**	**Element with highest individual U-Value**	
External walls	*0.26*	0.13	Walls (1) (0.13)	**OK**
Party walls	*0.2*	0	Party Wall (1) (0)	**N/A**
Curtain walls	*1.6*	0	N/A	**N/A**
Floors	*0.18*	0.09	Exposed Floor (0.14)	**OK**
Roofs	*0.16*	0.13	Roof (1) (0.13)	**OK**
Windows, doors, and roof windows	*1.6*	0.87	Front (1)	**OK**
Rooflights	*2.2*	N/A	N/A	**N/A**

2b Envelope elements (better than typically expected values are flagged with a subsequent (!))		
Name	**Net area [m^2]**	**U-Value [W/m^2K]**
Exposed wall: Walls (1)	52.2	0.13 **(!)**
Party wall: Party Wall (1)	88.21	0 **(!)**
Ground floor: GF, GF	41.18	0.08 **(!)**
Upper floor: Exposed Floor, Exposed Floor	8.6	0.14
Exposed roof: Roof (1)	49.779998779296875	0.13

2c Openings (better than typically expected values are flagged with a subsequent (!))				
Name	**Area [m^2]**	**Orientation**	**Frame factor**	**U-Value [W/m^2K]**
Front, Door	1.99	East	N/A	1 **(!)**
Front, Window	4.98	East	1.0	0.8 **(!)**
Rear, Window	3.53	West	1.0	0.8 **(!)**
Rear, Door	2.15	West	N/A	1 **(!)**

2d Thermal bridging (better than typically expected values are flagged with a subsequent (!))				
Building part **1**: Thermal bridging calculated from linear thermal transmittances for each junction				
Main element	**Junction detail**	**Source**	**Psi value [W/mK]**	**Drawing / reference**
External wall	E2: Other lintels (including other steel lintels)	Calculated by person with suitable expertise	0.115	Thermal Bridge Report

Main element	Junction detail	Source	Psi value [W/mK]	Drawing / reference
External wall	E3: Sill	Calculated by person with suitable expertise	0.017 **(!)**	Thermal Bridge Report
External wall	E4: Jamb	Calculated by person with suitable expertise	0.094	Thermal Bridge Report
External wall	E5: Ground floor (normal)	Calculated by person with suitable expertise	0.067	Thermal Bridge Report
External wall	E16: Corner (normal)	Calculated by person with suitable expertise	0.068	Thermal Bridge Report
External wall	E12: Gable (insulation at ceiling level)	Calculated by person with suitable expertise	0.077	Thermal Bridge Report
External wall	E6: Intermediate floor within a dwelling	Calculated by person with suitable expertise	0.032 **(!)**	Thermal Bridge Report
External wall	E17: Corner (inverted - internal area greater than external area)	Calculated by person with suitable expertise	-0.029 **(!)**	Thermal Bridge Report
Party wall	P1: Ground floor	SAP table default	0.32	K1
External wall	E20: Exposed floor (normal)	Calculated by person with suitable expertise	0.079	Thermal Bridge Report
External wall	E21: Exposed floor (inverted)	Calculated by person with suitable expertise	0.063	Thermal Bridge Report
External wall	E18: Party wall between dwellings	Calculated by person with suitable expertise	0.092	Thermal Bridge Report
Party wall	P4: Roof (insulation at ceiling level)	Calculated by person with suitable expertise	0.102	Thermal Bridge Report

3 Air permeability (better than typically expected values are flagged with a subsequent (!))		
Maximum permitted air permeability at 50Pa	*8 m^3/hm^2*	
Dwelling air permeability at 50Pa	5 m^3/hm^2, Measured value	**OK**
Air permeability test certificate reference		

4 Space heating	
Main heating system 1: Heat pump with radiators or underfloor heating - Electricity	
Efficiency	270.7%
Emitter type	Radiators
Flow temperature	45°C
System type	
Manufacturer	Daikin Europe NV
Model	EDLA09DA3V3
Commissioning	
Secondary heating system: N/A	
Fuel	N/A
Efficiency	N/A
Commissioning	

5 Hot water	
Cylinder/store - type: Cylinder	
Capacity	210 litres
Declared heat loss	1.58 kWh/day
Primary pipework insulated	Yes
Manufacturer	
Model	
Commissioning	
Waste water heat recovery system 1 - type: N/A	
Efficiency	
Manufacturer	
Model	

6 Controls	
Main heating 1 - type: Programmer, room thermostat and TRVs	
Function	
Ecodesign class	
Manufacturer	
Model	

Water heating - type: Cylinder thermostat and HW separately timed	
Manufacturer	
Model	

7 Lighting		
Minimum permitted light source efficacy	*75 lm/W*	
Lowest light source efficacy	80 lm/W	OK
External lights control	N/A	

8 Mechanical ventilation		
System type: Balanced whole-house mechanical ventilation with heat recovery		
Maximum permitted specific fan power	*1.5 W/(l/s)*	
Specific fan power	0.85 W/(l/s)	OK
Minimum permitted heat recovery efficiency	*73%*	
Heat recovery efficiency	90%	OK
Manufacturer/Model	DV110 Adroit	
Commissioning		

9 Local generation
N/A

10 Heat networks
N/A

11 Supporting documentary evidence	
Documentary evidence identified in 11.1 and 11.2 is needed to confirm the data values used for any calculations undertaken, manufacturer declarations made, and tests performed as reflected in this "As built" BREL Compliance Report are correct. 11.1 SAP Conventions, Appendix 1 (documentary evidence) schedules the minimum documentary evidence required. 11.2 Indicative photographic evidence of key stages during construction (guidance within Approved Document L, Volume 1 – Appendix B) that confirms the products identified in this BREL Compliance Report are used in this dwelling, and workmanship is of sufficient quality to support the calculated values claimed in 2a to 2d.	

12 Declarations	
a. Assessor Declaration	
This declaration by the assessor is confirmation that the contents of this BREL Compliance Report are a true and accurate reflection based upon the design and construction information submitted for this dwelling for the purpose of carrying out the assessment, and that the supporting documentary evidence (identified in 11.1 and 11.2) pursuant to Part L of the Building Regulations 2010 (as amended) has been reviewed in the course of preparing this BREL Compliance Report.	
Signed: Name:	Assessor ID: Date:
b. Client Declaration	
This declaration by the client is confirmation that the dwelling has been constructed and completed according to the specifications set out in this BREL Compliance Report, and that photographic evidence of key stages, as described in 11.2, has been provided to the Assessor for this dwelling.	
Signed: Name:	Organisation: Date:

Full SAP Calculation Printout

Property Reference	78449-02	**Issued on Date**	03/10/2025
Assessment Reference	001	**Prop Type Ref**	Mid
Property	852 Rochdale Road, MANCHESTER, M9 8FA		

SAP Rating	84 B	**DER**	3.62	**TER**	11.44
Environmental	97 A	**% DER < TER**			68.36
CO_2 Emissions (t/year)	0.32	**DFEE**	34.10	**TFEE**	36.90
Compliance Check	See BREL	**% DFEE < TFEE**			7.58
% DPER < TPER	36.04	**DPER**	38.33	**TPER**	59.93

Assessor Details	Mr. Daniel Goddard	**Assessor ID**	CP52-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	41.1800 (1b)	x	2.4800 (2b)	=	102.1264	(1b) - (3b)
First floor	49.7800 (1c)	x	2.7800 (2c)	=	138.3884	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	90.9600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	240.5148	(5)

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2. Ventilation rate

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				m3 per hour	
Number of open chimneys			0 * 80 =	0.0000	(6a)
Number of open flues			0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire			0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler			0 * 20 =	0.0000	(6d)
Number of flues attached to other heater			0 * 35 =	0.0000	(6e)
Number of blocked chimneys			0 * 20 =	0.0000	(6f)
Number of intermittent extract fans			0 * 10 =	0.0000	(7a)
Number of passive vents			0 * 10 =	0.0000	(7b)
Number of flueless gas fires			0 * 40 =	0.0000	(7c)
				Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =			0.0000 / (5) =	0.0000	(8)
Pressure test				Yes	
Pressure Test Method				Blower Door	
Measured/design AP50				5.0000	(17)
Infiltration rate				0.2500	(18)
Number of sides sheltered				2	(19)
Shelter factor			(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =	0.2125	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2709	0.2656	0.2603	0.2338	0.2284	0.2019	0.2019	0.1966	0.2125	0.2284	0.2391	0.2497	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	81.0000	(23c)

Effective ac	0.3659	0.3606	0.3553	0.3287	0.3234	0.2969	0.2969	0.2916	0.3075	0.3234	0.3341	0.3447	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door			4.1400	1.0000	4.1400			(26)
Window			8.5100	0.7752	6.5969			(27)
GF			41.1800	0.0800	3.2944	75.0000	3088.5000	(28a)
Exposed Floor			8.6000	0.1400	1.2040	20.0000	172.0000	(28b)
Main	64.8536	12.6500	52.2036	0.1300	6.7865	9.0000	469.8324	(29a)
PIJ	49.7800		49.7800	0.1300	6.4714	9.0000	448.0200	(30)
Total net area of external elements Aum(A, m2)			164.4136					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		28.4932			(33)
Main dwelling								
Party Wall 1			88.2100	0.0000	0.0000	20.0000	1764.2000	(32)
Timber			96.4800			9.0000	868.3200	(32c)
FF			41.1800			18.0000	741.2400	(32d)
GF			41.1800			9.0000	370.6200	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 7922.7324 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 87.1013 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	8.6300	0.1150	0.9925
E3 Sill	8.6300	0.0170	0.1467
E4 Jamb	28.2000	0.0940	2.6508
E5 Ground floor (normal)	13.8200	0.0670	0.9259
E16 Corner (normal)	4.9600	0.0680	0.3373
E12 Gable (insulation at ceiling level)	11.0000	0.0770	0.8470
E6 Intermediate floor within a dwelling	11.0000	0.0320	0.3520
E17 Corner (inverted - internal area greater than external area)	4.9600	-0.0290	-0.1438
P1 Party wall - Ground floor	15.2800	0.3200	4.8896
E20 Exposed floor (normal)	6.4400	0.0790	0.5088
E21 Exposed floor (inverted)	12.0800	0.0630	0.7610
E18 Party wall between dwellings	21.0400	0.0920	1.9357
P4 Party wall - Roof (insulation at ceiling level)	18.1000	0.1020	1.8462

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 16.0496 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 44.5428 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	29.0444	28.6228	28.2011	26.0928	25.6712	23.5629	23.5629	23.1413	24.4062	25.6712	26.5145	27.3578	(38)
Heat transfer coeff	73.5872	73.1656	72.7439	70.6356	70.2140	68.1057	68.1057	67.6841	68.9490	70.2140	71.0573	71.9006	(39)
Average = Sum(39)m / 12 =												70.5302	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8090	0.8044	0.7997	0.7766	0.7719	0.7487	0.7487	0.7441	0.7580	0.7719	0.7812	0.7905	(40)
HLP (average)												0.7754	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6386 (42)
Hot water usage for mixer showers

68.4610	67.4321	65.9329	63.0644	60.9476	58.5869	57.2450	58.7329	60.3639	62.8986	65.8287	68.1987	(42a)

Hot water usage for baths

29.5637	29.1246	28.5063	27.3663	26.5127	25.5661	25.0549	25.6688	26.3373	27.3502	28.5137	29.4637	(42b)

Hot water usage for other uses

41.6522	40.1376	38.6230	37.1084	35.5937	34.0791	34.0791	35.5937	37.1084	38.6230	40.1376	41.6522	(42c)

Average daily hot water use (litres/day) 128.3946 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	139.6769	136.6944	133.0622	127.5391	123.0540	118.2321	116.3790	119.9955	123.8096	128.8717	134.4799	139.3147	(44)
Energy conte	221.2141	194.6510	204.5117	174.5947	165.6543	145.3802	140.7503	148.5795	152.6696	174.8777	191.5913	218.1331	(45)
Energy content (annual)										Total = Sum(45)m =		2132.6075	

Distribution loss (46)m = 0.15 x (45)m

33.1821	29.1976	30.6768	26.1892	24.8482	21.8070	21.1126	22.2869	22.9004	26.2317	28.7387	32.7200	(46)

Water storage loss:
Store volume 210.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.5800 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.8532 (55)
Total storage loss

26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(56)

If cylinder contains dedicated solar storage

26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(57)
23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Primary loss
Combi loss
Total heat required for water heating calculated for each month

270.9257	239.5518	254.2233	222.7027	215.3659	193.4882	190.4619	198.2911	200.7776	224.5893	239.6993	267.8447	(62)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

WWHRS
PV diverter
Solar input
FGHRS
Output from w/h

270.9257	239.5518	254.2233	222.7027	215.3659	193.4882	190.4619	198.2911	200.7776	224.5893	239.6993	267.8447	(64)

Total per year (kWh/year) = Sum(64)m = 2717.9215 (64)
12Total per year (kWh/year) 2718 (64)
Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)
Heat gains from water heating, kWh/month

113.3230	100.6421	107.7694	96.5391	94.8493	86.8253	86.5688	89.1720	89.2490	97.9161	102.1905	112.2985	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	145.9975	161.6401	145.9975	150.8641	145.9975	150.8641	145.9975	145.9975	150.8641	145.9975	150.8641	145.9975	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	240.8328	243.3319	237.0343	223.6274	206.7036	190.7976	180.1714	177.6723	183.9699	197.3768	214.3007	230.2066	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	(71)
Water heating gains (Table 5)	152.3158	149.7650	144.8514	134.0821	127.4857	120.5907	116.3559	119.8548	123.9570	131.6077	141.9313	150.9389	(72)
Total internal gains	601.7256	617.3165	590.4626	571.1531	542.7662	524.8319	505.1042	506.1041	521.3705	537.5615	569.6755	589.7225	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a	g Specific data	FF Specific data	Access factor	Gains W

					W/m2	or Table 6b		or Table 6c		Table 6d			
East					4.9800	19.6403		0.3000	0.0000	0.7700		22.5938	(76)
West					3.5300	19.6403		0.3000	0.0000	0.7700		16.0153	(80)
Solar gains	38.6090	75.5274	124.3829	181.4051	222.3188	227.5828	216.6681	186.1147	144.6625	89.6197	48.1409	31.7502	(83)
Total gains	640.3346	692.8439	714.8456	752.5582	765.0850	752.4147	721.7724	692.2188	666.0330	627.1812	617.8164	621.4727	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	29.9068	30.0792	30.2535	31.1565	31.3436	32.3139	32.3139	32.5152	31.9186	31.3436	30.9716	30.6084	
alpha	2.9938	3.0053	3.0169	3.0771	3.0896	3.1543	3.1543	3.1677	3.1279	3.0896	3.0648	3.0406	
util living area	0.9265	0.9051	0.8739	0.8005	0.6927	0.5307	0.3996	0.4294	0.6194	0.8096	0.8956	0.9309	(86)
Living	19.2282	19.4614	19.7964	20.2867	20.6516	20.8954	20.9678	20.9595	20.8198	20.3698	19.7744	19.2315	
Non living	18.6144	18.8450	19.1745	19.6594	20.0000	20.2268	20.2808	20.2795	20.1607	19.7473	19.1690	18.6294	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.0936	19.4614	19.7964	20.2867	20.6516	20.8954	20.9678	20.9595	20.8198	20.3698	19.7744	19.4788	(87)
Th 2	20.2455	20.2495	20.2536	20.2737	20.2777	20.2980	20.2980	20.3020	20.2899	20.2777	20.2697	20.2616	(88)
util rest of house	0.9187	0.8951	0.8602	0.7788	0.6590	0.4827	0.3406	0.3702	0.5727	0.7849	0.8832	0.9236	(89)
MIT 2	19.4111	18.8450	19.1745	19.6594	20.0000	20.2268	20.2808	20.2795	20.1607	19.7473	19.1690	18.8577	(90)
Living area fraction										fLA = Living area / (4) =		0.3196	(91)
MIT	19.6292	19.0420	19.3732	19.8599	20.2082	20.4405	20.5004	20.4968	20.3713	19.9462	19.3625	19.0562	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6292	19.0420	19.3732	19.8599	20.2082	20.4405	20.5004	20.4968	20.3713	19.9462	19.3625	19.0562	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9114	0.8762	0.8417	0.7653	0.6556	0.4927	0.3579	0.3870	0.5783	0.7723	0.8653	0.9093	(94)
Useful gains	583.6055	607.0518	601.6955	575.9327	501.6028	370.7506	258.3504	267.9168	385.1931	484.3734	534.5741	565.0785	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1128.0364	1034.7055	936.4503	774.1591	597.3978	397.7702	265.6377	277.2882	432.4032	656.2346	871.3380	1068.1696	(97)
Space heating kWh	405.0565	287.3833	249.0575	142.7230	71.2714	0.0000	0.0000	0.0000	0.0000	127.8647	242.4700	374.2997	(98a)
Space heating requirement - total per year (kWh/year)												1900.1263	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	405.0565	287.3833	249.0575	142.7230	71.2714	0.0000	0.0000	0.0000	0.0000	127.8647	242.4700	374.2997	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1900.1263	
Space heating per m2											(98c) / (4) =	20.8897	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												270.7081	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	405.0565	287.3833	249.0575	142.7230	71.2714	0.0000	0.0000	0.0000	0.0000	127.8647	242.4700	374.2997	(98)
Space heating efficiency (main heating system 1)	270.7081	270.7081	270.7081	270.7081	270.7081	0.0000	0.0000	0.0000	0.0000	270.7081	270.7081	270.7081	(210)
Space heating fuel (main heating system)	149.6285	106.1598	92.0022	52.7221	26.3278	0.0000	0.0000	0.0000	0.0000	47.2334	89.5688	138.2669	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	270.9257	239.5518	254.2233	222.7027	215.3659	193.4882	190.4619	198.2911	200.7776	224.5893	239.6993	267.8447	(64)
Efficiency of water heater												281.1060	(216)
(217)m	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	(217)
Fuel for water heating, kWh/month	96.3785	85.2176	90.4368	79.2237	76.6138	68.8310	67.7545	70.5396	71.4242	79.8949	85.2701	95.2824	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	29.6563	26.7864	29.6563	28.6997	29.6563	28.6997	29.6563	29.6563	28.6997	29.6563	28.6997	29.6563	(231)
Lighting	30.8703	24.7653	22.2984	16.3368	12.6190	10.3098	11.5115	14.9631	19.4355	25.5005	28.8027	31.7283	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	701.9096	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	281.1060	
Water heating fuel used	966.8671	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.1900)		
mechanical ventilation fans (SFP = 1.1900)	349.1794	(230a)
Total electricity for the above, kWh/year	349.1794	(231)
Electricity for lighting (calculated in Appendix L)	249.1413	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2267.0974	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	701.9096	0.1552	108.9520	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	966.8671	0.1410	136.2905	(264)
Space and water heating			245.2426	(265)
Pumps, fans and electric keep-hot	349.1794	0.1387	48.4355	(267)
Energy for lighting	249.1413	0.1443	35.9588	(268)
Total CO2, kg/year			329.6368	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.6200	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	701.9096	1.5746	1105.2587	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	966.8671	1.5212	1470.8230	(278)
Space and water heating			2576.0817	(279)
Pumps, fans and electric keep-hot	349.1794	1.5128	528.2386	(281)
Energy for lighting	249.1413	1.5338	382.1413	(282)
Total Primary energy kWh/year			3486.4616	(286)
Dwelling Primary energy Rate (DPER)			38.3300	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	41.1800	(1b)	x 2.4800	(2b) =	102.1264	(1b) - (3b)
First floor	49.7800	(1c)	x 2.7800	(2c) =	138.3884	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	90.9600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		240.5148	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1247	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3747	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3185	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)

Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4061	0.3982	0.3902	0.3504	0.3424	0.3026	0.3026	0.2946	0.3185	0.3424	0.3583	0.3743 (22b)
Effective ac	0.5825	0.5793	0.5761	0.5614	0.5586	0.5458	0.5458	0.5434	0.5507	0.5586	0.5642	0.5700 (25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			4.1400	1.0000	4.1400			(26)
TER Opening Type			8.5100	1.1450	9.7443			(27)
GF			41.1800	0.1300	5.3534			(28a)
Exposed Floor			8.6000	0.1300	1.1180			(28b)
Main	64.8536	12.6500	52.2036	0.1800	9.3966			(29a)
PIJ	49.7800		49.7800	0.1100	5.4758			(30)
Total net area of external elements Aum(A, m2)			164.4136					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	35.2281			(33)
Main dwelling								
Party Wall 1			88.2100	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	87.1013	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	8.6300	0.0500	0.4315
E3 Sill	8.6300	0.0500	0.4315
E4 Jamb	28.2000	0.0500	1.4100
E5 Ground floor (normal)	13.8200	0.1600	2.2112
E16 Corner (normal)	4.9600	0.0900	0.4464
E12 Gable (insulation at ceiling level)	11.0000	0.0600	0.6600
E6 Intermediate floor within a dwelling	11.0000	0.0000	0.0000
E17 Corner (inverted - internal area greater than external area)	4.9600	-0.0900	-0.4464
P1 Party wall - Ground floor	15.2800	0.0800	1.2224
E20 Exposed floor (normal)	6.4400	0.3200	2.0608
E21 Exposed floor (inverted)	12.0800	0.3200	3.8656
E18 Party wall between dwellings	21.0400	0.0600	1.2624
P4 Party wall - Roof (insulation at ceiling level)	18.1000	0.1200	2.1720

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		15.7274	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	50.9555	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	46.2302	45.9760	45.7269	44.5568	44.3378	43.3187	43.3187	43.1299	43.7112	44.3378	44.7807	45.2438	(38)
Heat transfer coeff	97.1857	96.9316	96.6824	95.5123	95.2934	94.2742	94.2742	94.0855	94.6668	95.2934	95.7363	96.1993	(39)
Average = Sum(39)m / 12 =												95.5112	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0684	1.0657	1.0629	1.0500	1.0476	1.0364	1.0364	1.0344	1.0408	1.0476	1.0525	1.0576	(40)
HLP (average)												1.0500	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy											2.6386	(42)
Hot water usage for mixer showers	68.4610	67.4321	65.9329	63.0644	60.9476	58.5869	57.2450	58.7329	60.3639	62.8986	65.8287	68.1987 (42a)
Hot water usage for baths	29.5637	29.1246	28.5063	27.3663	26.5127	25.5661	25.0549	25.6688	26.3373	27.3502	28.5137	29.4637 (42b)
Hot water usage for other uses	41.6522	40.1376	38.6230	37.1084	35.5937	34.0791	34.0791	35.5937	37.1084	38.6230	40.1376	41.6522 (42c)
Average daily hot water use (litres/day)												128.3946 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	139.6769	136.6944	133.0622	127.5391	123.0540	118.2321	116.3790	119.9955	123.8096	128.8717	134.4799	139.3147	(44)
Energy conte	221.2141	194.6510	204.5117	174.5947	165.6543	145.3802	140.7503	148.5795	152.6696	174.8777	191.5913	218.1331	(45)
Energy content (annual)										Total = Sum(45)m =		2132.6075	
Distribution loss (46)m = 0.15 x (45)m	33.1821	29.1976	30.6768	26.1892	24.8482	21.8070	21.1126	22.2869	22.9004	26.2317	28.7387	32.7200	(46)
Water storage loss:													
Store volume												210.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7016	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.9188	(55)
Total storage loss	28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842	(56)
If cylinder contains dedicated solar storage	28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	272.9607	241.3898	256.2583	224.6720	217.4009	195.4575	192.4969	200.3261	202.7469	226.6243	241.6687	269.8797	(62)
WWHRS	-31.2975	-27.6798	-28.9847	-24.0004	-22.3675	-19.1401	-17.9408	-19.0782	-19.8031	-23.3456	-26.4477	-30.7179	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	241.6632	213.7101	227.2737	200.6716	195.0334	176.3175	174.5562	181.2479	182.9439	203.2787	215.2209	239.1618	(64)
										Total per year (kWh/year) = Sum(64)m =		2451.0786	(64)
12Total per year (kWh/year)												2451	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	114.9510	102.1125	109.3974	98.1146	96.4773	88.4008	88.1968	90.7999	90.8245	99.5441	103.7660	113.9265	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

(66)m	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	142.2156	157.4530	142.2156	146.9561	142.2156	146.9561	142.2156	142.2156	146.9561	142.2156	146.9561	142.2156	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	240.8328	243.3319	237.0343	223.6274	206.7036	190.7976	180.1714	177.6723	183.9699	197.3768	214.3007	230.2066	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	(71)
Water heating gains (Table 5)													
	154.5040	151.9532	147.0395	136.2703	129.6738	122.7789	118.5440	122.0429	126.1452	133.7959	144.1194	153.1270	(72)
Total internal gains													
	603.1319	618.3176	591.8689	572.4333	544.1725	523.1121	503.5105	504.5103	519.6507	538.9678	570.9557	591.1288	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	4.9800	19.6403	0.6300	0.7000	0.7700	29.8916	(76)
West	3.5300	19.6403	0.6300	0.7000	0.7700	21.1882	(80)

Solar gains	51.0797	99.9228	164.5586	239.9990	294.1277	301.0921	286.6519	246.2298	191.3885	118.5668	63.6904	42.0055	(83)
Total gains	654.2116	718.2404	756.4276	812.4323	838.3003	824.2042	790.1625	750.7401	711.0392	657.5346	634.6461	633.1343	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	22.6449	22.7043	22.7628	23.0416	23.0946	23.3442	23.3442	23.3911	23.2474	23.0946	22.9877	22.8771	
alpha	2.5097	2.5136	2.5175	2.5361	2.5396	2.5563	2.5563	2.5594	2.5498	2.5396	2.5325	2.5251	
util living area													
	0.9363	0.9179	0.8900	0.8294	0.7371	0.6002	0.4715	0.5071	0.6872	0.8450	0.9135	0.9408	(86)
MIT	18.4665	18.7376	19.1692	19.7832	20.3219	20.7241	20.8928	20.8676	20.5829	19.8994	19.1053	18.4305	(87)
Th 2	20.0267	20.0290	20.0312	20.0418	20.0438	20.0531	20.0531	20.0548	20.0495	20.0438	20.0398	20.0356	(88)
util rest of house													
	0.9284	0.9077	0.8757	0.8060	0.6983	0.5374	0.3858	0.4222	0.6306	0.8190	0.9010	0.9333	(89)
MIT 2	17.0633	17.4054	17.9489	18.7154	19.3635	19.8213	19.9856	19.9670	19.6760	18.8716	17.8806	17.0230	(90)
Living area fraction										fLA = Living area / (4) =		0.3196	(91)
MIT	17.5118	17.8312	18.3389	19.0566	19.6698	20.1098	20.2755	20.2548	19.9659	19.2001	18.2720	17.4728	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.5118	17.8312	18.3389	19.0566	19.6698	20.1098	20.2755	20.2548	19.9659	19.2001	18.2720	17.4728	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9004	0.8773	0.8442	0.7775	0.6812	0.5414	0.4069	0.4412	0.6251	0.7913	0.8712	0.9063	(94)
Useful gains	589.0216	630.1383	638.5494	631.6864	571.0784	446.2550	321.5222	331.1952	444.4610	520.3070	552.8988	573.8331	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1283.9967	1253.4418	1144.6149	970.0843	759.4665	519.4329	346.5070	362.6828	555.3014	819.5308	1069.5680	1276.8325	(97)
Space heating kWh													
	517.0614	418.8600	376.5127	243.6465	140.1607	0.0000	0.0000	0.0000	0.0000	222.6225	372.0018	523.0315	(98a)
Space heating requirement - total per year (kWh/year)												2813.8972	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	517.0614	418.8600	376.5127	243.6465	140.1607	0.0000	0.0000	0.0000	0.0000	222.6225	372.0018	523.0315	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2813.8972	
Space heating per m2											(98c) / (4) =	30.9355	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	517.0614	418.8600	376.5127	243.6465	140.1607	0.0000	0.0000	0.0000	0.0000	222.6225	372.0018	523.0315	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	560.1966	453.8028	407.9227	263.9724	151.8534	0.0000	0.0000	0.0000	0.0000	241.1945	403.0355	566.6647	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	241.6632	213.7101	227.2737	200.6716	195.0334	176.3175	174.5562	181.2479	182.9439	203.2787	215.2209	239.1618	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.7207	85.5407	85.1837	84.4960	83.3316	79.8000	79.8000	79.8000	79.8000	84.2641	85.2751	85.7649	(217)
Fuel for water heating, kWh/month													
	281.9193	249.8345	266.8041	237.4923	234.0450	220.9492	218.7421	227.1276	229.2530	241.2400	252.3842	278.8574	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)

Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	29.5496	23.7058	21.3444	15.6378	12.0791	9.8687	11.0190	14.3229	18.6040	24.4095	27.5704	30.3709	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-38.9812	-55.1702	-79.5760	-89.7571	-96.9883	-90.5718	-89.4598	-84.3870	-75.4216	-63.2498	-42.9366	-33.6769	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-21.3144	-44.9402	-89.5251	-134.7575	-178.4789	-179.4591	-177.3409	-150.0006	-109.7478	-64.3537	-28.4842	-16.8460	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	3048.6426	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2938.6486	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	238.4821	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-2035.4247	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	4276.3487	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3048.6426	0.2100	640.2150	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2938.6486	0.2100	617.1162	(264)
Space and water heating			1257.3312	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	238.4821	0.1443	34.4203	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-840.1762	0.1345	-113.0202	
PV Unit electricity exported	-1195.2485	0.1258	-150.3985	
Total			-263.4187	(269)
Total CO2, kg/year			1040.2621	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.4400	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	3048.6426	1.1300	3444.9662	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2938.6486	1.1300	3320.6730	(278)
Space and water heating			6765.6391	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	238.4821	1.5338	365.7919	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-840.1762	1.4972	-1257.8767	
PV Unit electricity exported	-1195.2485	0.4619	-552.0620	
Total			-1809.9387	(283)
Total Primary energy kWh/year			5451.5931	(286)
Target Primary Energy Rate (TPER)			59.9300	(287)

Full SAP Calculation Printout

Property Reference	78449-02	**Issued on Date**	03/10/2025
Assessment Reference	001	**Prop Type Ref**	Mid
Property	852 Rochdale Road, MANCHESTER, M9 8FA		

SAP Rating	84 B	**DER**	3.62	**TER**	11.44
Environmental	97 A	**% DER < TER**			68.36
CO_2 Emissions (t/year)	0.32	**DFEE**	34.10	**TFEE**	36.90
Compliance Check	See BREL	**% DFEE < TFEE**			7.58
% DPER < TPER	36.04	**DPER**	38.33	**TPER**	59.93

Assessor Details	Mr. Daniel Goddard	**Assessor ID**	CP52-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	41.1800 (1b)	x	2.4800 (2b)	=	102.1264	(1b) - (3b)
First floor	49.7800 (1c)	x	2.7800 (2c)	=	138.3884	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	90.9600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	240.5148	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1247	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3747	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3185	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4061	0.3982	0.3902	0.3504	0.3424	0.3026	0.3026	0.2946	0.3185	0.3424	0.3583	0.3743	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0.0000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5825	0.5793	0.5761	0.5614	0.5586	0.5458	0.5458	0.5434	0.5507	0.5586	0.5642	0.5700	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door			4.1400	1.0000	4.1400			(26)
Window			8.5100	0.7752	6.5969			(27)
GF			41.1800	0.0800	3.2944	75.0000	3088.5000	(28a)
Exposed Floor			8.6000	0.1400	1.2040	20.0000	172.0000	(28b)
Main	64.8536	12.6500	52.2036	0.1300	6.7865	9.0000	469.8324	(29a)
PIJ	49.7800		49.7800	0.1300	6.4714	9.0000	448.0200	(30)
Total net area of external elements Aum(A, m2)			164.4136					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	28.4932			(33)
Main dwelling								
Party Wall 1			88.2100	0.0000	0.0000	20.0000	1764.2000	(32)
Timber			96.4800			9.0000	868.3200	(32c)
FF			41.1800			18.0000	741.2400	(32d)
GF			41.1800			9.0000	370.6200	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	7922.7324 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		87.1013 (35)
List of Thermal Bridges		

	Length	Psi-value	Total	
K1 Element				
E2 Other lintels (including other steel lintels)	8.6300	0.1150	0.9925	
E3 Sill	8.6300	0.0170	0.1467	
E4 Jamb	28.2000	0.0940	2.6508	
E5 Ground floor (normal)	13.8200	0.0670	0.9259	
E16 Corner (normal)	4.9600	0.0680	0.3373	
E12 Gable (insulation at ceiling level)	11.0000	0.0770	0.8470	
E6 Intermediate floor within a dwelling	11.0000	0.0320	0.3520	
E17 Corner (inverted - internal area greater than external area)	4.9600	-0.0290	-0.1438	
P1 Party wall - Ground floor	15.2800	0.3200	4.8896	
E20 Exposed floor (normal)	6.4400	0.0790	0.5088	
E21 Exposed floor (inverted)	12.0800	0.0630	0.7610	
E18 Party wall between dwellings	21.0400	0.0920	1.9357	
P4 Party wall - Roof (insulation at ceiling level)	18.1000	0.1020	1.8462	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			16.0496	(36)
Point Thermal bridges		(36a) =	0.0000	
Total fabric heat loss		(33) + (36) + (36a) =	44.5428	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	46.2302	45.9760	45.7269	44.5568	44.3378	43.3187	43.3187	43.1299	43.7112	44.3378	44.7807	45.2438	(38)
Heat transfer coeff	90.7730	90.5188	90.2697	89.0996	88.8806	87.8615	87.8615	87.6727	88.2540	88.8806	89.3235	89.7865	(39)
Average = Sum(39)m / 12 =												89.0985	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9979	0.9951	0.9924	0.9795	0.9771	0.9659	0.9659	0.9639	0.9703	0.9771	0.9820	0.9871	(40)
HLP (average)												0.9795	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy											2.6386	(42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	29.5637	29.1246	28.5063	27.3663	26.5127	25.5661	25.0549	25.6688	26.3373	27.3502	28.5137	29.4637	(42b)
Hot water usage for other uses	41.6522	40.1376	38.6230	37.1084	35.5937	34.0791	34.0791	35.5937	37.1084	38.6230	40.1376	41.6522	(42c)
Average daily hot water use (litres/day)												65.2759	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	71.2159	69.2622	67.1293	64.4747	62.1064	59.6452	59.1340	61.2626	63.4457	65.9732	68.6513	71.1160	(44)
Energy conte	112.7886	98.6285	103.1753	88.2626	83.6072	73.3408	71.5174	75.8559	78.2349	89.5249	97.8063	111.3504	(45)
Energy content (annual)										Total = Sum(45)m =		1084.0928	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	95.8703	83.8342	87.6990	75.0232	71.0661	62.3397	60.7898	64.4775	66.4996	76.0962	83.1354	94.6479	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	95.8703	83.8342	87.6990	75.0232	71.0661	62.3397	60.7898	64.4775	66.4996	76.0962	83.1354	94.6479	(64)
									Total per year (kWh/year) = Sum(64)m =			921.4789	(64)
12Total per year (kWh/year)												921	(64)
Electric shower(s)	54.8258	48.8503	53.3426	50.9042	51.8594	49.4688	51.1178	51.8594	50.9042	53.3426	52.3396	54.8258	(64a)
					Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =							623.6406	(64a)
Heat gains from water heating, kWh/month	37.6740	33.1711	35.2604	31.4819	30.7314	27.9521	27.9769	29.0842	29.3510	32.3597	33.8687	37.3684	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	145.9975	161.6401	145.9975	150.8641	145.9975	150.8641	145.9975	145.9975	150.8641	145.9975	150.8641	145.9975	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	240.8328	243.3319	237.0343	223.6274	206.7036	190.7976	180.1714	177.6723	183.9699	197.3768	214.3007	230.2066	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	(71)
Water heating gains (Table 5)	50.6372	49.3618	47.3930	43.7248	41.3056	38.8224	37.6034	39.0917	40.7652	43.4942	47.0399	50.2264	(72)
Total internal gains	500.0470	516.9133	493.0043	480.7957	456.5862	443.0635	426.3517	425.3410	438.1787	449.4480	474.7841	489.0100	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	4.9800	19.6403	0.3000	0.0000	0.7700	22.5938	(76)
West	3.5300	19.6403	0.3000	0.0000	0.7700	16.0153	(80)

Solar gains	38.6090	75.5274	124.3829	181.4051	222.3188	227.5828	216.6681	186.1147	144.6625	89.6197	48.1409	31.7502	(83)

Total gains	538.6560	592.4407	617.3872	662.2009	678.9049	670.6464	643.0199	611.4557	582.8412	539.0677	522.9250	520.7602	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	24.2446	24.3127	24.3798	24.7000	24.7608	25.0481	25.0481	25.1020	24.9366	24.7608	24.6381	24.5110	
alpha	2.6163	2.6208	2.6253	2.6467	2.6507	2.6699	2.6699	2.6735	2.6624	2.6507	2.6425	2.6341	
util living area	0.9559	0.9417	0.9214	0.8722	0.7931	0.6608	0.5283	0.5653	0.7427	0.8840	0.9385	0.9594	(86)
MIT	18.4198	18.6789	19.0881	19.7002	20.2511	20.6888	20.8776	20.8494	20.5410	19.8360	19.0522	18.3883	(87)
Th 2	20.0850	20.0874	20.0897	20.1004	20.1024	20.1118	20.1118	20.1136	20.1082	20.1024	20.0984	20.0941	(88)
util rest of house	0.9503	0.9342	0.9107	0.8536	0.7597	0.6014	0.4422	0.4812	0.6918	0.8635	0.9294	0.9542	(89)
MIT 2	17.7111	17.9680	18.3730	18.9767	19.5019	19.9005	20.0485	20.0317	19.7770	19.1170	18.3471	17.6860	(90)
Living area fraction										fLA = Living area / (4) =		0.3196	(91)
MIT	17.9375	18.1952	18.6016	19.2080	19.7413	20.1525	20.3135	20.2930	20.0212	19.3468	18.5724	17.9105	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.9375	18.1952	18.6016	19.2080	19.7413	20.1525	20.3135	20.2930	20.0212	19.3468	18.5724	17.9105	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9326	0.9142	0.8887	0.8315	0.7445	0.6044	0.4629	0.4994	0.6862	0.8424	0.9094	0.9374	(94)
Useful gains	502.3694	541.5870	548.6931	550.6202	505.4243	405.3280	297.6315	305.3646	399.9404	454.1350	475.5614	488.1676	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1237.9208	1203.4648	1092.4050	918.4345	714.7182	487.8473	326.2740	341.3136	522.5687	777.4204	1024.7572	1231.0144	(97)
Space heating kWh	547.2502	444.7819	404.5217	264.8262	155.7146	0.0000	0.0000	0.0000	0.0000	240.5244	395.4210	552.6780	(98a)
Space heating requirement - total per year (kWh/year)												3005.7180	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	547.2502	444.7819	404.5217	264.8262	155.7146	0.0000	0.0000	0.0000	0.0000	240.5244	395.4210	552.6780	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3005.7180	
Space heating per m2											(98c) / (4) =	33.0444	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	825.8978	650.1748	666.3128	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.6697	0.7435	0.7164	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	553.1317	483.4155	477.3560	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	708.6181	679.8104	645.9957	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	111.9502	146.1178	125.4679	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	27.9876	36.5295	31.3670	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												95.8840	(107)
Energy for space heating												33.0444	(99)
Energy for space cooling												1.0541	(108)
Total												34.0985	(109)
Fabric Energy Efficiency (DFEE)												34.1	(109)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	41.1800	(1b) x	2.4800	(2b) =	102.1264	(1b) - (3b)
First floor	49.7800	(1c) x	2.7800	(2c) =	138.3884	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	90.9600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		240.5148	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)

Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1247 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3747 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3185 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4061	0.3982	0.3902	0.3504	0.3424	0.3026	0.3026	0.2946	0.3185	0.3424	0.3583	0.3743	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5825	0.5793	0.5761	0.5614	0.5586	0.5458	0.5458	0.5434	0.5507	0.5586	0.5642	0.5700	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			4.1400	1.0000	4.1400			(26)
TER Opening Type			8.5100	1.1450	9.7443			(27)
GF			41.1800	0.1300	5.3534			(28a)
Exposed Floor			8.6000	0.1300	1.1180			(28b)
Main	64.8536	12.6500	52.2036	0.1800	9.3966			(29a)
PIJ	49.7800		49.7800	0.1100	5.4758			(30)
Total net area of external elements Aum(A, m2)			164.4136					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		35.2281			(33)
Main dwelling								
Party Wall 1			88.2100	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	87.1013 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	8.6300	0.0500	0.4315
E3 Sill	8.6300	0.0500	0.4315
E4 Jamb	28.2000	0.0500	1.4100
E5 Ground floor (normal)	13.8200	0.1600	2.2112
E16 Corner (normal)	4.9600	0.0900	0.4464
E12 Gable (insulation at ceiling level)	11.0000	0.0600	0.6600
E6 Intermediate floor within a dwelling	11.0000	0.0000	0.0000
E17 Corner (inverted - internal area greater than external area)	4.9600	-0.0900	-0.4464
P1 Party wall - Ground floor	15.2800	0.0800	1.2224
E20 Exposed floor (normal)	6.4400	0.3200	2.0608
E21 Exposed floor (inverted)	12.0800	0.3200	3.8656
E18 Party wall between dwellings	21.0400	0.0600	1.2624
P4 Party wall - Roof (insulation at ceiling level)	18.1000	0.1200	2.1720

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		15.7274 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	50.9555 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	46.2302	45.9760	45.7269	44.5568	44.3378	43.3187	43.3187	43.1299	43.7112	44.3378	44.7807	45.2438	(38)
Heat transfer coeff	97.1857	96.9316	96.6824	95.5123	95.2934	94.2742	94.2742	94.0855	94.6668	95.2934	95.7363	96.1993	(39)
Average = Sum(39)m / 12 =												95.5112	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0684	1.0657	1.0629	1.0500	1.0476	1.0364	1.0364	1.0344	1.0408	1.0476	1.0525	1.0576	(40)
HLP (average)												1.0500	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.6386 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

29.5637	29.1246	28.5063	27.3663	26.5127	25.5661	25.0549	25.6688	26.3373	27.3502	28.5137	29.4637	(42b)

Hot water usage for other uses

41.6522	40.1376	38.6230	37.1084	35.5937	34.0791	34.0791	35.5937	37.1084	38.6230	40.1376	41.6522	(42c)

Average daily hot water use (litres/day)	65.2759 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	71.2159	69.2622	67.1293	64.4747	62.1064	59.6452	59.1340	61.2626	63.4457	65.9732	68.6513	71.1160	(44)
Energy conte	112.7886	98.6285	103.1753	88.2626	83.6072	73.3408	71.5174	75.8559	78.2349	89.5249	97.8063	111.3504	(45)
Energy content (annual)										Total = Sum(45)m =		1084.0928	
Distribution loss (46)m = 0.15 x (45)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	95.8703	83.8342	87.6990	75.0232	71.0661	62.3397	60.7898	64.4775	66.4996	76.0962	83.1354	94.6479	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													

	95.8703	83.8342	87.6990	75.0232	71.0661	62.3397	60.7898	64.4775	66.4996	76.0962	83.1354	94.6479 (64)
									Total per year (kWh/year) = Sum(64)m =			921.4789 (64)
12Total per year (kWh/year)												921 (64)
Electric shower(s)												
	54.8258	48.8503	53.3426	50.9042	51.8594	49.4688	51.1178	51.8594	50.9042	53.3426	52.3396	54.8258 (64a)
								Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =				623.6406 (64a)
Heat gains from water heating, kWh/month												
	37.6740	33.1711	35.2604	31.4819	30.7314	27.9521	27.9769	29.0842	29.3510	32.3597	33.8687	37.3684 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	142.2156	157.4530	142.2156	146.9561	142.2156	146.9561	142.2156	142.2156	146.9561	142.2156	146.9561	142.2156	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	240.8328	243.3319	237.0343	223.6274	206.7036	190.7976	180.1714	177.6723	183.9699	197.3768	214.3007	230.2066	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	(71)
Water heating gains (Table 5)													
	50.6372	49.3618	47.3930	43.7248	41.3056	38.8224	37.6034	39.0917	40.7652	43.4942	47.0399	50.2264	(72)
Total internal gains													
	496.2651	512.7262	489.2224	476.8878	452.8043	439.1556	422.5699	421.5591	434.2708	445.6662	470.8762	485.2281	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	4.9800	19.6403	0.6300	0.7000	0.7700	29.8916	(76)
West	3.5300	19.6403	0.6300	0.7000	0.7700	21.1882	(80)

Solar gains	51.0797	99.9228	164.5586	239.9990	294.1277	301.0921	286.6519	246.2298	191.3885	118.5668	63.6904	42.0055	(83)
Total gains	547.3448	612.6490	653.7810	716.8868	746.9320	740.2477	709.2218	667.7889	625.6593	564.2330	534.5666	527.2336	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	22.6449	22.7043	22.7628	23.0416	23.0946	23.3442	23.3442	23.3911	23.2474	23.0946	22.9877	22.8771	
alpha	2.5097	2.5136	2.5175	2.5361	2.5396	2.5563	2.5563	2.5594	2.5498	2.5396	2.5325	2.5251	
util living area													
	0.9557	0.9398	0.9161	0.8613	0.7758	0.6421	0.5125	0.5525	0.7336	0.8808	0.9381	0.9594	(86)
MIT	18.2422	18.5281	18.9823	19.6407	20.2246	20.6750	20.8697	20.8378	20.5077	19.7511	18.9079	18.2044	(87)
Th 2	20.0267	20.0290	20.0312	20.0418	20.0438	20.0531	20.0531	20.0548	20.0495	20.0438	20.0398	20.0356	(88)
util rest of house													
	0.9499	0.9319	0.9044	0.8408	0.7395	0.5795	0.4228	0.4645	0.6796	0.8590	0.9287	0.9540	(89)
MIT 2	17.4981	17.7812	18.2298	18.8766	19.4303	19.8370	19.9879	19.9692	19.6997	18.9942	18.1669	17.4665	(90)
Living area fraction										fLA = Living area / (4) =		0.3196	(91)
MIT	17.7359	18.0199	18.4703	19.1208	19.6841	20.1048	20.2697	20.2468	19.9579	19.2361	18.4037	17.7023	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.7359	18.0199	18.4703	19.1208	19.6841	20.1048	20.2697	20.2468	19.9579	19.2361	18.4037	17.7023	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9312	0.9105	0.8807	0.8173	0.7241	0.5832	0.4446	0.4836	0.6738	0.8365	0.9075	0.9364	(94)
Useful gains	509.7024	557.7967	575.7672	585.8931	540.8308	431.7068	315.2887	322.9581	421.5423	471.9565	485.1347	493.6945	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1305.7780	1271.7336	1157.3180	976.2114	760.8353	518.9595	345.9597	361.9301	554.5528	822.9632	1082.1775	1298.9102	(97)
Space heating kWh													
	592.2802	479.7656	432.6738	281.0292	163.6834	0.0000	0.0000	0.0000	0.0000	261.1490	429.8708	599.0805	(98a)
Space heating requirement - total per year (kWh/year)												3239.5326	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	592.2802	479.7656	432.6738	281.0292	163.6834	0.0000	0.0000	0.0000	0.0000	261.1490	429.8708	599.0805	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3239.5326	
Space heating per m2											(98c) / (4) =	35.6149	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	886.1775	697.6291	715.0496	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.6784	0.7494	0.7194	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	601.1936	522.8145	514.4272	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	794.2071	761.2522	715.7953	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	138.9697	177.3976	149.8178	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)

Space cooling kWh

0.0000	0.0000	0.0000	0.0000	0.0000	34.7424	44.3494	37.4545	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement											116.5463 (107)
Energy for space heating											35.6149 (99)
Energy for space cooling											1.2813 (108)
Total											36.8962 (109)
Fabric Energy Efficiency (TFEE)											36.9 (109)

Full SAP Calculation Printout

Property Reference	78449-02	**Issued on Date**	03/10/2025
Assessment Reference	001	**Prop Type Ref**	Mid
Property	852 Rochdale Road, MANCHESTER, M9 8FA		

SAP Rating	84 B	**DER**	3.62	**TER**	11.44
Environmental	97 A	**% DER < TER**			68.36
CO_2 Emissions (t/year)	0.32	**DFEE**	34.10	**TFEE**	36.90
Compliance Check	See BREL	**% DFEE < TFEE**			7.58
% DPER < TPER	36.04	**DPER**	38.33	**TPER**	59.93

Assessor Details	Mr. Daniel Goddard	**Assessor ID**	CP52-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	41.1800 (1b)	x	2.4800 (2b)	=	102.1264	(1b) - (3b)
First floor	49.7800 (1c)	x	2.7800 (2c)	=	138.3884	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	90.9600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	240.5148	(5)

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2. Ventilation rate

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				m3 per hour	
Number of open chimneys			0 * 80 =	0.0000	(6a)
Number of open flues			0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire			0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler			0 * 20 =	0.0000	(6d)
Number of flues attached to other heater			0 * 35 =	0.0000	(6e)
Number of blocked chimneys			0 * 20 =	0.0000	(6f)
Number of intermittent extract fans			0 * 10 =	0.0000	(7a)
Number of passive vents			0 * 10 =	0.0000	(7b)
Number of flueless gas fires			0 * 40 =	0.0000	(7c)
				Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =			0.0000 / (5) =	0.0000	(8)
Pressure test				Yes	
Pressure Test Method				Blower Door	
Measured/design AP50				5.0000	(17)
Infiltration rate				0.2500	(18)
Number of sides sheltered				2	(19)
Shelter factor			(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =	0.2125	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2709	0.2656	0.2603	0.2338	0.2284	0.2019	0.2019	0.1966	0.2125	0.2284	0.2391	0.2497	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	81.0000	(23c)

Effective ac	0.3659	0.3606	0.3553	0.3287	0.3234	0.2969	0.2969	0.2916	0.3075	0.3234	0.3341	0.3447	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door			4.1400	1.0000	4.1400			(26)
Window			8.5100	0.7752	6.5969			(27)
GF			41.1800	0.0800	3.2944	75.0000	3088.5000	(28a)
Exposed Floor			8.6000	0.1400	1.2040	20.0000	172.0000	(28b)
Main	64.8536	12.6500	52.2036	0.1300	6.7865	9.0000	469.8324	(29a)
PIJ	49.7800		49.7800	0.1300	6.4714	9.0000	448.0200	(30)
Total net area of external elements Aum(A, m2)			164.4136					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		28.4932			(33)
Main dwelling								
Party Wall 1			88.2100	0.0000	0.0000	20.0000	1764.2000	(32)
Timber			96.4800			9.0000	868.3200	(32c)
FF			41.1800			18.0000	741.2400	(32d)
GF			41.1800			9.0000	370.6200	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 7922.7324 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 87.1013 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	8.6300	0.1150	0.9925
E3 Sill	8.6300	0.0170	0.1467
E4 Jamb	28.2000	0.0940	2.6508
E5 Ground floor (normal)	13.8200	0.0670	0.9259
E16 Corner (normal)	4.9600	0.0680	0.3373
E12 Gable (insulation at ceiling level)	11.0000	0.0770	0.8470
E6 Intermediate floor within a dwelling	11.0000	0.0320	0.3520
E17 Corner (inverted - internal area greater than external area)	4.9600	-0.0290	-0.1438
P1 Party wall - Ground floor	15.2800	0.3200	4.8896
E20 Exposed floor (normal)	6.4400	0.0790	0.5088
E21 Exposed floor (inverted)	12.0800	0.0630	0.7610
E18 Party wall between dwellings	21.0400	0.0920	1.9357
P4 Party wall - Roof (insulation at ceiling level)	18.1000	0.1020	1.8462

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 16.0496 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 44.5428 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	29.0444	28.6228	28.2011	26.0928	25.6712	23.5629	23.5629	23.1413	24.4062	25.6712	26.5145	27.3578	(38)
Heat transfer coeff	73.5872	73.1656	72.7439	70.6356	70.2140	68.1057	68.1057	67.6841	68.9490	70.2140	71.0573	71.9006	(39)
Average = Sum(39)m / 12 =												70.5302	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8090	0.8044	0.7997	0.7766	0.7719	0.7487	0.7487	0.7441	0.7580	0.7719	0.7812	0.7905	(40)
HLP (average)												0.7754	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6386 (42)
Hot water usage for mixer showers

68.4610	67.4321	65.9329	63.0644	60.9476	58.5869	57.2450	58.7329	60.3639	62.8986	65.8287	68.1987	(42a)

Hot water usage for baths

29.5637	29.1246	28.5063	27.3663	26.5127	25.5661	25.0549	25.6688	26.3373	27.3502	28.5137	29.4637	(42b)

Hot water usage for other uses

41.6522	40.1376	38.6230	37.1084	35.5937	34.0791	34.0791	35.5937	37.1084	38.6230	40.1376	41.6522	(42c)

Average daily hot water use (litres/day) 128.3946 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	139.6769	136.6944	133.0622	127.5391	123.0540	118.2321	116.3790	119.9955	123.8096	128.8717	134.4799	139.3147	(44)
Energy conte	221.2141	194.6510	204.5117	174.5947	165.6543	145.3802	140.7503	148.5795	152.6696	174.8777	191.5913	218.1331	(45)
Energy content (annual)										Total = Sum(45)m =		2132.6075	

Distribution loss (46)m = 0.15 x (45)m

33.1821	29.1976	30.6768	26.1892	24.8482	21.8070	21.1126	22.2869	22.9004	26.2317	28.7387	32.7200	(46)

Water storage loss:
Store volume 210.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.5800 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.8532 (55)
Total storage loss

26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(56)

If cylinder contains dedicated solar storage

26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(57)
23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Primary loss
Combi loss
Total heat required for water heating calculated for each month

270.9257	239.5518	254.2233	222.7027	215.3659	193.4882	190.4619	198.2911	200.7776	224.5893	239.6993	267.8447	(62)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

WWHRS
PV diverter
Solar input
FGHRS
Output from w/h

270.9257	239.5518	254.2233	222.7027	215.3659	193.4882	190.4619	198.2911	200.7776	224.5893	239.6993	267.8447	(64)

Total per year (kWh/year) = Sum(64)m = 2717.9215 (64)
12Total per year (kWh/year) 2718 (64)
Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)
Heat gains from water heating, kWh/month

113.3230	100.6421	107.7694	96.5391	94.8493	86.8253	86.5688	89.1720	89.2490	97.9161	102.1905	112.2985	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	145.9975	161.6401	145.9975	150.8641	145.9975	150.8641	145.9975	145.9975	150.8641	145.9975	150.8641	145.9975	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	240.8328	243.3319	237.0343	223.6274	206.7036	190.7976	180.1714	177.6723	183.9699	197.3768	214.3007	230.2066	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	(71)
Water heating gains (Table 5)	152.3158	149.7650	144.8514	134.0821	127.4857	120.5907	116.3559	119.8548	123.9570	131.6077	141.9313	150.9389	(72)
Total internal gains	601.7256	617.3165	590.4626	571.1531	542.7662	524.8319	505.1042	506.1041	521.3705	537.5615	569.6755	589.7225	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a	g Specific data	FF Specific data	Access factor	Gains W

					W/m2	or Table 6b		or Table 6c		Table 6d			
East					4.9800	19.6403		0.3000	0.0000	0.7700		22.5938	(76)
West					3.5300	19.6403		0.3000	0.0000	0.7700		16.0153	(80)
Solar gains	38.6090	75.5274	124.3829	181.4051	222.3188	227.5828	216.6681	186.1147	144.6625	89.6197	48.1409	31.7502	(83)
Total gains	640.3346	692.8439	714.8456	752.5582	765.0850	752.4147	721.7724	692.2188	666.0330	627.1812	617.8164	621.4727	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	29.9068	30.0792	30.2535	31.1565	31.3436	32.3139	32.3139	32.5152	31.9186	31.3436	30.9716	30.6084	
alpha	2.9938	3.0053	3.0169	3.0771	3.0896	3.1543	3.1543	3.1677	3.1279	3.0896	3.0648	3.0406	
util living area	0.9265	0.9051	0.8739	0.8005	0.6927	0.5307	0.3996	0.4294	0.6194	0.8096	0.8956	0.9309	(86)
Living	19.2282	19.4614	19.7964	20.2867	20.6516	20.8954	20.9678	20.9595	20.8198	20.3698	19.7744	19.2315	
Non living	18.6144	18.8450	19.1745	19.6594	20.0000	20.2268	20.2808	20.2795	20.1607	19.7473	19.1690	18.6294	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.0936	19.4614	19.7964	20.2867	20.6516	20.8954	20.9678	20.9595	20.8198	20.3698	19.7744	19.4788	(87)
Th 2	20.2455	20.2495	20.2536	20.2737	20.2777	20.2980	20.2980	20.3020	20.2899	20.2777	20.2697	20.2616	(88)
util rest of house	0.9187	0.8951	0.8602	0.7788	0.6590	0.4827	0.3406	0.3702	0.5727	0.7849	0.8832	0.9236	(89)
MIT 2	19.4111	18.8450	19.1745	19.6594	20.0000	20.2268	20.2808	20.2795	20.1607	19.7473	19.1690	18.8577	(90)
Living area fraction										fLA = Living area / (4) =		0.3196	(91)
MIT	19.6292	19.0420	19.3732	19.8599	20.2082	20.4405	20.5004	20.4968	20.3713	19.9462	19.3625	19.0562	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6292	19.0420	19.3732	19.8599	20.2082	20.4405	20.5004	20.4968	20.3713	19.9462	19.3625	19.0562	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9114	0.8762	0.8417	0.7653	0.6556	0.4927	0.3579	0.3870	0.5783	0.7723	0.8653	0.9093	(94)
Useful gains	583.6055	607.0518	601.6955	575.9327	501.6028	370.7506	258.3504	267.9168	385.1931	484.3734	534.5741	565.0785	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1128.0364	1034.7055	936.4503	774.1591	597.3978	397.7702	265.6377	277.2882	432.4032	656.2346	871.3380	1068.1696	(97)
Space heating kWh	405.0565	287.3833	249.0575	142.7230	71.2714	0.0000	0.0000	0.0000	0.0000	127.8647	242.4700	374.2997	(98a)
Space heating requirement - total per year (kWh/year)												1900.1263	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	405.0565	287.3833	249.0575	142.7230	71.2714	0.0000	0.0000	0.0000	0.0000	127.8647	242.4700	374.2997	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1900.1263	
Space heating per m2											(98c) / (4) =	20.8897	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												270.7081	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	405.0565	287.3833	249.0575	142.7230	71.2714	0.0000	0.0000	0.0000	0.0000	127.8647	242.4700	374.2997	(98)
Space heating efficiency (main heating system 1)	270.7081	270.7081	270.7081	270.7081	270.7081	0.0000	0.0000	0.0000	0.0000	270.7081	270.7081	270.7081	(210)
Space heating fuel (main heating system)	149.6285	106.1598	92.0022	52.7221	26.3278	0.0000	0.0000	0.0000	0.0000	47.2334	89.5688	138.2669	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	270.9257	239.5518	254.2233	222.7027	215.3659	193.4882	190.4619	198.2911	200.7776	224.5893	239.6993	267.8447	(64)
Efficiency of water heater												281.1060	(216)
(217)m	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	(217)
Fuel for water heating, kWh/month	96.3785	85.2176	90.4368	79.2237	76.6138	68.8310	67.7545	70.5396	71.4242	79.8949	85.2701	95.2824	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	29.6563	26.7864	29.6563	28.6997	29.6563	28.6997	29.6563	29.6563	28.6997	29.6563	28.6997	29.6563	(231)
Lighting	30.8703	24.7653	22.2984	16.3368	12.6190	10.3098	11.5115	14.9631	19.4355	25.5005	28.8027	31.7283	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	701.9096	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	281.1060	
Water heating fuel used	966.8671	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.1900)		
mechanical ventilation fans (SFP = 1.1900)	349.1794	(230a)
Total electricity for the above, kWh/year	349.1794	(231)
Electricity for lighting (calculated in Appendix L)	249.1413	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2267.0974	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	701.9096	0.1552	108.9520	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	966.8671	0.1410	136.2905	(264)
Space and water heating			245.2426	(265)
Pumps, fans and electric keep-hot	349.1794	0.1387	48.4355	(267)
Energy for lighting	249.1413	0.1443	35.9588	(268)
Total CO2, kg/year			329.6368	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.6200	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	701.9096	1.5746	1105.2587	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	966.8671	1.5212	1470.8230	(278)
Space and water heating			2576.0817	(279)
Pumps, fans and electric keep-hot	349.1794	1.5128	528.2386	(281)
Energy for lighting	249.1413	1.5338	382.1413	(282)
Total Primary energy kWh/year			3486.4616	(286)
Dwelling Primary energy Rate (DPER)			38.3300	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	41.1800	(1b)	x 2.4800	(2b) =	102.1264	(1b) - (3b)
First floor	49.7800	(1c)	x 2.7800	(2c) =	138.3884	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	90.9600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		240.5148	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1247	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3747	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3185	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)

Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4061	0.3982	0.3902	0.3504	0.3424	0.3026	0.3026	0.2946	0.3185	0.3424	0.3583	0.3743 (22b)
Effective ac	0.5825	0.5793	0.5761	0.5614	0.5586	0.5458	0.5458	0.5434	0.5507	0.5586	0.5642	0.5700 (25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			4.1400	1.0000	4.1400			(26)
TER Opening Type			8.5100	1.1450	9.7443			(27)
GF			41.1800	0.1300	5.3534			(28a)
Exposed Floor			8.6000	0.1300	1.1180			(28b)
Main	64.8536	12.6500	52.2036	0.1800	9.3966			(29a)
PIJ	49.7800		49.7800	0.1100	5.4758			(30)
Total net area of external elements Aum(A, m2)			164.4136					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	35.2281			(33)
Main dwelling								
Party Wall 1			88.2100	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	87.1013	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	8.6300	0.0500	0.4315
E3 Sill	8.6300	0.0500	0.4315
E4 Jamb	28.2000	0.0500	1.4100
E5 Ground floor (normal)	13.8200	0.1600	2.2112
E16 Corner (normal)	4.9600	0.0900	0.4464
E12 Gable (insulation at ceiling level)	11.0000	0.0600	0.6600
E6 Intermediate floor within a dwelling	11.0000	0.0000	0.0000
E17 Corner (inverted - internal area greater than external area)	4.9600	-0.0900	-0.4464
P1 Party wall - Ground floor	15.2800	0.0800	1.2224
E20 Exposed floor (normal)	6.4400	0.3200	2.0608
E21 Exposed floor (inverted)	12.0800	0.3200	3.8656
E18 Party wall between dwellings	21.0400	0.0600	1.2624
P4 Party wall - Roof (insulation at ceiling level)	18.1000	0.1200	2.1720

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		15.7274	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	50.9555	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	46.2302	45.9760	45.7269	44.5568	44.3378	43.3187	43.3187	43.1299	43.7112	44.3378	44.7807	45.2438	(38)
Heat transfer coeff	97.1857	96.9316	96.6824	95.5123	95.2934	94.2742	94.2742	94.0855	94.6668	95.2934	95.7363	96.1993	(39)
Average = Sum(39)m / 12 =												95.5112	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0684	1.0657	1.0629	1.0500	1.0476	1.0364	1.0364	1.0344	1.0408	1.0476	1.0525	1.0576	(40)
HLP (average)												1.0500	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy											2.6386	(42)
Hot water usage for mixer showers	68.4610	67.4321	65.9329	63.0644	60.9476	58.5869	57.2450	58.7329	60.3639	62.8986	65.8287	68.1987 (42a)
Hot water usage for baths	29.5637	29.1246	28.5063	27.3663	26.5127	25.5661	25.0549	25.6688	26.3373	27.3502	28.5137	29.4637 (42b)
Hot water usage for other uses	41.6522	40.1376	38.6230	37.1084	35.5937	34.0791	34.0791	35.5937	37.1084	38.6230	40.1376	41.6522 (42c)
Average daily hot water use (litres/day)												128.3946 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	139.6769	136.6944	133.0622	127.5391	123.0540	118.2321	116.3790	119.9955	123.8096	128.8717	134.4799	139.3147	(44)
Energy conte	221.2141	194.6510	204.5117	174.5947	165.6543	145.3802	140.7503	148.5795	152.6696	174.8777	191.5913	218.1331	(45)
Energy content (annual)										Total = Sum(45)m =		2132.6075	
Distribution loss (46)m = 0.15 x (45)m	33.1821	29.1976	30.6768	26.1892	24.8482	21.8070	21.1126	22.2869	22.9004	26.2317	28.7387	32.7200	(46)
Water storage loss:													
Store volume												210.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7016	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.9188	(55)
Total storage loss	28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842	(56)
If cylinder contains dedicated solar storage	28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	272.9607	241.3898	256.2583	224.6720	217.4009	195.4575	192.4969	200.3261	202.7469	226.6243	241.6687	269.8797	(62)
WWHRS	-31.2975	-27.6798	-28.9847	-24.0004	-22.3675	-19.1401	-17.9408	-19.0782	-19.8031	-23.3456	-26.4477	-30.7179	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	241.6632	213.7101	227.2737	200.6716	195.0334	176.3175	174.5562	181.2479	182.9439	203.2787	215.2209	239.1618	(64)
										Total per year (kWh/year) = Sum(64)m =		2451.0786	(64)
12Total per year (kWh/year)												2451	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	114.9510	102.1125	109.3974	98.1146	96.4773	88.4008	88.1968	90.7999	90.8245	99.5441	103.7660	113.9265	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

(66)m	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	142.2156	157.4530	142.2156	146.9561	142.2156	146.9561	142.2156	142.2156	146.9561	142.2156	146.9561	142.2156	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	240.8328	243.3319	237.0343	223.6274	206.7036	190.7976	180.1714	177.6723	183.9699	197.3768	214.3007	230.2066	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	(71)
Water heating gains (Table 5)													
	154.5040	151.9532	147.0395	136.2703	129.6738	122.7789	118.5440	122.0429	126.1452	133.7959	144.1194	153.1270	(72)
Total internal gains													
	603.1319	618.3176	591.8689	572.4333	544.1725	523.1121	503.5105	504.5103	519.6507	538.9678	570.9557	591.1288	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	4.9800	19.6403	0.6300	0.7000	0.7700	29.8916	(76)
West	3.5300	19.6403	0.6300	0.7000	0.7700	21.1882	(80)

Solar gains	51.0797	99.9228	164.5586	239.9990	294.1277	301.0921	286.6519	246.2298	191.3885	118.5668	63.6904	42.0055	(83)
Total gains	654.2116	718.2404	756.4276	812.4323	838.3003	824.2042	790.1625	750.7401	711.0392	657.5346	634.6461	633.1343	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	22.6449	22.7043	22.7628	23.0416	23.0946	23.3442	23.3442	23.3911	23.2474	23.0946	22.9877	22.8771	
alpha	2.5097	2.5136	2.5175	2.5361	2.5396	2.5563	2.5563	2.5594	2.5498	2.5396	2.5325	2.5251	
util living area													
	0.9363	0.9179	0.8900	0.8294	0.7371	0.6002	0.4715	0.5071	0.6872	0.8450	0.9135	0.9408	(86)
MIT	18.4665	18.7376	19.1692	19.7832	20.3219	20.7241	20.8928	20.8676	20.5829	19.8994	19.1053	18.4305	(87)
Th 2	20.0267	20.0290	20.0312	20.0418	20.0438	20.0531	20.0531	20.0548	20.0495	20.0438	20.0398	20.0356	(88)
util rest of house													
	0.9284	0.9077	0.8757	0.8060	0.6983	0.5374	0.3858	0.4222	0.6306	0.8190	0.9010	0.9333	(89)
MIT 2	17.0633	17.4054	17.9489	18.7154	19.3635	19.8213	19.9856	19.9670	19.6760	18.8716	17.8806	17.0230	(90)
Living area fraction										fLA = Living area / (4) =		0.3196	(91)
MIT	17.5118	17.8312	18.3389	19.0566	19.6698	20.1098	20.2755	20.2548	19.9659	19.2001	18.2720	17.4728	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.5118	17.8312	18.3389	19.0566	19.6698	20.1098	20.2755	20.2548	19.9659	19.2001	18.2720	17.4728	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9004	0.8773	0.8442	0.7775	0.6812	0.5414	0.4069	0.4412	0.6251	0.7913	0.8712	0.9063	(94)
Useful gains	589.0216	630.1383	638.5494	631.6864	571.0784	446.2550	321.5222	331.1952	444.4610	520.3070	552.8988	573.8331	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1283.9967	1253.4418	1144.6149	970.0843	759.4665	519.4329	346.5070	362.6828	555.3014	819.5308	1069.5680	1276.8325	(97)
Space heating kWh													
	517.0614	418.8600	376.5127	243.6465	140.1607	0.0000	0.0000	0.0000	0.0000	222.6225	372.0018	523.0315	(98a)
Space heating requirement - total per year (kWh/year)												2813.8972	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	517.0614	418.8600	376.5127	243.6465	140.1607	0.0000	0.0000	0.0000	0.0000	222.6225	372.0018	523.0315	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2813.8972	
Space heating per m2											(98c) / (4) =	30.9355	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	517.0614	418.8600	376.5127	243.6465	140.1607	0.0000	0.0000	0.0000	0.0000	222.6225	372.0018	523.0315	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	560.1966	453.8028	407.9227	263.9724	151.8534	0.0000	0.0000	0.0000	0.0000	241.1945	403.0355	566.6647	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	241.6632	213.7101	227.2737	200.6716	195.0334	176.3175	174.5562	181.2479	182.9439	203.2787	215.2209	239.1618	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.7207	85.5407	85.1837	84.4960	83.3316	79.8000	79.8000	79.8000	79.8000	84.2641	85.2751	85.7649	(217)
Fuel for water heating, kWh/month													
	281.9193	249.8345	266.8041	237.4923	234.0450	220.9492	218.7421	227.1276	229.2530	241.2400	252.3842	278.8574	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)

Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	29.5496	23.7058	21.3444	15.6378	12.0791	9.8687	11.0190	14.3229	18.6040	24.4095	27.5704	30.3709	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-38.9812	-55.1702	-79.5760	-89.7571	-96.9883	-90.5718	-89.4598	-84.3870	-75.4216	-63.2498	-42.9366	-33.6769	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-21.3144	-44.9402	-89.5251	-134.7575	-178.4789	-179.4591	-177.3409	-150.0006	-109.7478	-64.3537	-28.4842	-16.8460	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	3048.6426	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2938.6486	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	238.4821	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-2035.4247	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	4276.3487	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3048.6426	0.2100	640.2150	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2938.6486	0.2100	617.1162	(264)
Space and water heating			1257.3312	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	238.4821	0.1443	34.4203	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-840.1762	0.1345	-113.0202	
PV Unit electricity exported	-1195.2485	0.1258	-150.3985	
Total			-263.4187	(269)
Total CO2, kg/year			1040.2621	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.4400	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	3048.6426	1.1300	3444.9662	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2938.6486	1.1300	3320.6730	(278)
Space and water heating			6765.6391	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	238.4821	1.5338	365.7919	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-840.1762	1.4972	-1257.8767	
PV Unit electricity exported	-1195.2485	0.4619	-552.0620	
Total			-1809.9387	(283)
Total Primary energy kWh/year			5451.5931	(286)
Target Primary Energy Rate (TPER)			59.9300	(287)

Full SAP Calculation Printout

Property Reference	78449-02	**Issued on Date**	03/10/2025
Assessment Reference	001	**Prop Type Ref**	Mid
Property	852 Rochdale Road, MANCHESTER, M9 8FA		

SAP Rating	84 B	**DER**	3.62	**TER**	11.44
Environmental	97 A	**% DER < TER**			68.36
CO_2 Emissions (t/year)	0.32	**DFEE**	34.10	**TFEE**	36.90
Compliance Check	See BREL	**% DFEE < TFEE**			7.58
% DPER < TPER	36.04	**DPER**	38.33	**TPER**	59.93

Assessor Details	Mr. Daniel Goddard	**Assessor ID**	CP52-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	41.1800 (1b)	x	2.4800 (2b)	=	102.1264	(1b) - (3b)
First floor	49.7800 (1c)	x	2.7800 (2c)	=	138.3884	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	90.9600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	240.5148	(5)

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2. Ventilation rate

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				m3 per hour	
Number of open chimneys			0 * 80 =	0.0000	(6a)
Number of open flues			0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire			0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler			0 * 20 =	0.0000	(6d)
Number of flues attached to other heater			0 * 35 =	0.0000	(6e)
Number of blocked chimneys			0 * 20 =	0.0000	(6f)
Number of intermittent extract fans			0 * 10 =	0.0000	(7a)
Number of passive vents			0 * 10 =	0.0000	(7b)
Number of flueless gas fires			0 * 40 =	0.0000	(7c)
				Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =			0.0000 / (5) =	0.0000	(8)
Pressure test				Yes	
Pressure Test Method				Blower Door	
Measured/design AP50				5.0000	(17)
Infiltration rate				0.2500	(18)
Number of sides sheltered				2	(19)
Shelter factor			(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =	0.2125	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2709	0.2656	0.2603	0.2338	0.2284	0.2019	0.2019	0.1966	0.2125	0.2284	0.2391	0.2497	(22b)

Balanced mechanical ventilation with heat recovery		
If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	81.0000	(23c)

Effective ac	0.3659	0.3606	0.3553	0.3287	0.3234	0.2969	0.2969	0.2916	0.3075	0.3234	0.3341	0.3447	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door			4.1400	1.0000	4.1400			(26)
Window			8.5100	0.7752	6.5969			(27)
GF			41.1800	0.0800	3.2944	75.0000	3088.5000	(28a)
Exposed Floor			8.6000	0.1400	1.2040	20.0000	172.0000	(28b)
Main	64.8536	12.6500	52.2036	0.1300	6.7865	9.0000	469.8324	(29a)
PIJ	49.7800		49.7800	0.1300	6.4714	9.0000	448.0200	(30)
Total net area of external elements Aum(A, m2)			164.4136					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		28.4932			(33)
Main dwelling								
Party Wall 1			88.2100	0.0000	0.0000	20.0000	1764.2000	(32)
Timber			96.4800			9.0000	868.3200	(32c)
FF			41.1800			18.0000	741.2400	(32d)
GF			41.1800			9.0000	370.6200	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 7922.7324 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 87.1013 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	8.6300	0.1150	0.9925
E3 Sill	8.6300	0.0170	0.1467
E4 Jamb	28.2000	0.0940	2.6508
E5 Ground floor (normal)	13.8200	0.0670	0.9259
E16 Corner (normal)	4.9600	0.0680	0.3373
E12 Gable (insulation at ceiling level)	11.0000	0.0770	0.8470
E6 Intermediate floor within a dwelling	11.0000	0.0320	0.3520
E17 Corner (inverted - internal area greater than external area)	4.9600	-0.0290	-0.1438
P1 Party wall - Ground floor	15.2800	0.3200	4.8896
E20 Exposed floor (normal)	6.4400	0.0790	0.5088
E21 Exposed floor (inverted)	12.0800	0.0630	0.7610
E18 Party wall between dwellings	21.0400	0.0920	1.9357
P4 Party wall - Roof (insulation at ceiling level)	18.1000	0.1020	1.8462

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 16.0496 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 44.5428 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	29.0444	28.6228	28.2011	26.0928	25.6712	23.5629	23.5629	23.1413	24.4062	25.6712	26.5145	27.3578	(38)
Heat transfer coeff	73.5872	73.1656	72.7439	70.6356	70.2140	68.1057	68.1057	67.6841	68.9490	70.2140	71.0573	71.9006	(39)
Average = Sum(39)m / 12 =												70.5302	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8090	0.8044	0.7997	0.7766	0.7719	0.7487	0.7487	0.7441	0.7580	0.7719	0.7812	0.7905	(40)
HLP (average)												0.7754	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6386 (42)
Hot water usage for mixer showers

68.4610	67.4321	65.9329	63.0644	60.9476	58.5869	57.2450	58.7329	60.3639	62.8986	65.8287	68.1987	(42a)

Hot water usage for baths

29.5637	29.1246	28.5063	27.3663	26.5127	25.5661	25.0549	25.6688	26.3373	27.3502	28.5137	29.4637	(42b)

Hot water usage for other uses

41.6522	40.1376	38.6230	37.1084	35.5937	34.0791	34.0791	35.5937	37.1084	38.6230	40.1376	41.6522	(42c)

Average daily hot water use (litres/day) 128.3946 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	139.6769	136.6944	133.0622	127.5391	123.0540	118.2321	116.3790	119.9955	123.8096	128.8717	134.4799	139.3147	(44)
Energy conte	221.2141	194.6510	204.5117	174.5947	165.6543	145.3802	140.7503	148.5795	152.6696	174.8777	191.5913	218.1331	(45)
Energy content (annual)										Total = Sum(45)m =		2132.6075	

Distribution loss (46)m = 0.15 x (45)m

33.1821	29.1976	30.6768	26.1892	24.8482	21.8070	21.1126	22.2869	22.9004	26.2317	28.7387	32.7200	(46)

Water storage loss:
Store volume 210.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.5800 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.8532 (55)
Total storage loss

26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(56)

If cylinder contains dedicated solar storage

26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(57)
23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Primary loss
Combi loss
Total heat required for water heating calculated for each month

270.9257	239.5518	254.2233	222.7027	215.3659	193.4882	190.4619	198.2911	200.7776	224.5893	239.6993	267.8447	(62)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

WWHRS
PV diverter
Solar input
FGHRS
Output from w/h

270.9257	239.5518	254.2233	222.7027	215.3659	193.4882	190.4619	198.2911	200.7776	224.5893	239.6993	267.8447	(64)
									Total per year (kWh/year) = Sum(64)m =		2717.9215	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)

Heat gains from water heating, kWh/month

113.3230	100.6421	107.7694	96.5391	94.8493	86.8253	86.5688	89.1720	89.2490	97.9161	102.1905	112.2985	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	35.2685	31.3252	25.4754	19.2865	14.4169	12.1713	13.1516	17.0949	22.9447	29.1336	34.0032	36.2488	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	359.4520	363.1820	353.7825	333.7722	308.5128	284.7725	268.9125	265.1825	274.5820	294.5923	319.8517	343.5920	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	(71)
Water heating gains (Table 5)	152.3158	149.7650	144.8514	134.0821	127.4857	120.5907	116.3559	119.8548	123.9570	131.6077	141.9313	150.9389	(72)
Total internal gains	653.2794	650.5153	630.3524	593.3839	556.6585	523.7777	504.6631	508.3753	527.7268	561.5767	602.0293	637.0228	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W

East				4.9800		19.6403		0.3000		0.0000		0.7700		22.5938 (76)
West				3.5300		19.6403		0.3000		0.0000		0.7700		16.0153 (80)
Solar gains	38.6090	75.5274	124.3829	181.4051	222.3188	227.5828	216.6681	186.1147	144.6625	89.6197	48.1409	31.7502	(83)
Total gains	691.8885	726.0427	754.7353	774.7891	778.9772	751.3605	721.3312	694.4900	672.3893	651.1964	650.1702	668.7729	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	29.9068	30.0792	30.2535	31.1565	31.3436	32.3139	32.3139	32.5152	31.9186	31.3436	30.9716	30.6084	
alpha	2.9938	3.0053	3.0169	3.0771	3.0896	3.1543	3.1543	3.1677	3.1279	3.0896	3.0648	3.0406	
util living area	0.9130	0.8953	0.8598	0.7904	0.6853	0.5313	0.3998	0.4281	0.6153	0.7969	0.8839	0.9186	(86)
Living	19.3352	19.5255	19.8642	20.3151	20.6625	20.8951	20.9678	20.9598	20.8232	20.4014	19.8348	19.3320	
Non living	18.7181	18.9066	19.2387	19.6852	20.0091	20.2266	20.2808	20.2797	20.1633	19.7757	19.2264	18.7270	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.1483	19.5255	19.8642	20.3151	20.6625	20.8951	20.9678	20.9598	20.8232	20.4014	19.8348	19.5653	(87)
Th 2	20.2455	20.2495	20.2536	20.2737	20.2777	20.2980	20.2980	20.3020	20.2899	20.2777	20.2697	20.2616	(88)
util rest of house	0.9039	0.8846	0.8451	0.7682	0.6514	0.4833	0.3408	0.3691	0.5687	0.7713	0.8706	0.9102	(89)
MIT 2	19.4642	18.9066	19.2387	19.6852	20.0091	20.2266	20.2808	20.2797	20.1633	19.7757	19.2264	18.9416	(90)
Living area fraction										fLA = Living area / (4) =		0.3196	(91)
MIT	19.6828	19.1044	19.4386	19.8865	20.2180	20.4402	20.5003	20.4970	20.3742	19.9756	19.4208	19.1409	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6828	19.1044	19.4386	19.8865	20.2180	20.4402	20.5003	20.4970	20.3742	19.9756	19.4208	19.1409	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8965	0.8654	0.8269	0.7553	0.6485	0.4933	0.3581	0.3859	0.5745	0.7596	0.8526	0.8952	(94)
Useful gains	620.2474	628.3480	624.1182	585.2252	505.1566	370.6474	258.3365	268.0102	386.2635	494.6223	554.3581	598.7034	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1131.9783	1039.2719	941.2033	776.0376	598.0796	397.7520	265.6354	277.3043	432.5995	658.3016	875.4841	1074.2629	(97)
Space heating kWh	380.7278	276.1409	235.9113	137.3849	69.1347	0.0000	0.0000	0.0000	0.0000	121.7775	231.2107	353.8162	(98a)
Space heating requirement - total per year (kWh/year)												1806.1040	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	380.7278	276.1409	235.9113	137.3849	69.1347	0.0000	0.0000	0.0000	0.0000	121.7775	231.2107	353.8162	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1806.1040	
Space heating per m2											(98c) / (4) =	19.8560	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												270.7081	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	380.7278	276.1409	235.9113	137.3849	69.1347	0.0000	0.0000	0.0000	0.0000	121.7775	231.2107	353.8162	(98)
Space heating efficiency (main heating system 1)	270.7081	270.7081	270.7081	270.7081	270.7081	0.0000	0.0000	0.0000	0.0000	270.7081	270.7081	270.7081	(210)
Space heating fuel (main heating system)	140.6414	102.0069	87.1460	50.7502	25.5385	0.0000	0.0000	0.0000	0.0000	44.9848	85.4096	130.7003	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	270.9257	239.5518	254.2233	222.7027	215.3659	193.4882	190.4619	198.2911	200.7776	224.5893	239.6993	267.8447	(64)
Efficiency of water heater												281.1060	(216)
(217)m	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	(217)
Fuel for water heating, kWh/month	96.3785	85.2176	90.4368	79.2237	76.6138	68.8310	67.7545	70.5396	71.4242	79.8949	85.2701	95.2824	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	29.6563	26.7864	29.6563	28.6997	29.6563	28.6997	29.6563	29.6563	28.6997	29.6563	28.6997	29.6563	(231)
Lighting	30.8703	24.7653	22.2984	16.3368	12.6190	10.3098	11.5115	14.9631	19.4355	25.5005	28.8027	31.7283	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													

Space heating fuel - main system 1	667.1777	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	281.1060	
Water heating fuel used	966.8671	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.1900)		
mechanical ventilation fans (SFP = 1.1900)	349.1794	(230a)
Total electricity for the above, kWh/year	349.1794	(231)
Electricity for lighting (calculated in Appendix L)	249.1413	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2232.3655	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	667.1777	16.4900	110.0176	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	966.8671	16.4900	159.4364	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	349.1794	16.4900	57.5797	(249)
Energy for lighting	249.1413	16.4900	41.0834	(250)
Additional standing charges			0.0000	(251)
Total energy cost			368.1171	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.9747	(257)
SAP value		84.1999	
SAP rating (Section 12)		84	(258)
SAP band		B	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	667.1777	0.1552	103.5263	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	966.8671	0.1410	136.2905	(264)
Space and water heating			239.8168	(265)
Pumps, fans and electric keep-hot	349.1794	0.1387	48.4355	(267)
Energy for lighting	249.1413	0.1443	35.9588	(268)
Total CO2, kg/year			324.2111	(272)
CO2 emissions per m2			3.5600	(273)
EI value			96.8046	
EI rating			97	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	41.1800 (1b)	x	2.4800 (2b)	=	102.1264	(1b) - (3b)
First floor	49.7800 (1c)	x	2.7800 (2c)	=	138.3884	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 90.9600						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		240.5148	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.2500 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2125 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.6000	4.5000	4.5000	4.1000	4.2000	3.7000	3.5000	3.5000	3.7000	4.1000	4.1000	4.2000	(22)
Wind factor	1.1500	1.1250	1.1250	1.0250	1.0500	0.9250	0.8750	0.8750	0.9250	1.0250	1.0250	1.0500	(22a)
Adj infilt rate	0.2444	0.2391	0.2391	0.2178	0.2231	0.1966	0.1859	0.1859	0.1966	0.2178	0.2178	0.2231	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	81.0000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.3394	0.3341	0.3341	0.3128	0.3181	0.2916	0.2809	0.2809	0.2916	0.3128	0.3128	0.3181	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door			4.1400	1.0000	4.1400			(26)
Window			8.5100	0.7752	6.5969			(27)
GF			41.1800	0.0800	3.2944	75.0000	3088.5000	(28a)
Exposed Floor			8.6000	0.1400	1.2040	20.0000	172.0000	(28b)
Main	64.8536	12.6500	52.2036	0.1300	6.7865	9.0000	469.8324	(29a)
PIJ	49.7800		49.7800	0.1300	6.4714	9.0000	448.0200	(30)
Total net area of external elements Aum(A, m2)			164.4136					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	28.4932			(33)
Main dwelling								
Party Wall 1			88.2100	0.0000	0.0000	20.0000	1764.2000	(32)
Timber			96.4800			9.0000	868.3200	(32c)
FF			41.1800			18.0000	741.2400	(32d)
GF			41.1800			9.0000	370.6200	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) =	7922.7324 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	87.1013 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	8.6300	0.1150	0.9925
E3 Sill	8.6300	0.0170	0.1467
E4 Jamb	28.2000	0.0940	2.6508
E5 Ground floor (normal)	13.8200	0.0670	0.9259
E16 Corner (normal)	4.9600	0.0680	0.3373
E12 Gable (insulation at ceiling level)	11.0000	0.0770	0.8470
E6 Intermediate floor within a dwelling	11.0000	0.0320	0.3520
E17 Corner (inverted - internal area greater than external area)	4.9600	-0.0290	-0.1438
P1 Party wall - Ground floor	15.2800	0.3200	4.8896
E20 Exposed floor (normal)	6.4400	0.0790	0.5088
E21 Exposed floor (inverted)	12.0800	0.0630	0.7610
E18 Party wall between dwellings	21.0400	0.0920	1.9357
P4 Party wall - Roof (insulation at ceiling level)	18.1000	0.1020	1.8462

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		16.0496 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	44.5428 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	26.9362	26.5145	26.5145	24.8279	25.2495	23.1413	22.2980	22.2980	23.1413	24.8279	24.8279	25.2495	(38)
Heat transfer coeff	71.4789	71.0573	71.0573	69.3707	69.7923	67.6841	66.8408	66.8408	67.6841	69.3707	69.3707	69.7923	(39)
Average = Sum(39)m / 12 =												69.1950	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7858	0.7812	0.7812	0.7627	0.7673	0.7441	0.7348	0.7348	0.7441	0.7627	0.7627	0.7673	(40)
HLP (average)												0.7607	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.6386 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	68.4610	67.4321	65.9329	63.0644	60.9476	58.5869	57.2450	58.7329	60.3639	62.8986	65.8287	68.1987	(42a)
Hot water usage for baths	29.5637	29.1246	28.5063	27.3663	26.5127	25.5661	25.0549	25.6688	26.3373	27.3502	28.5137	29.4637	(42b)
Hot water usage for other uses	41.6522	40.1376	38.6230	37.1084	35.5937	34.0791	34.0791	35.5937	37.1084	38.6230	40.1376	41.6522	(42c)
Average daily hot water use (litres/day)												128.3946	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	139.6769	136.6944	133.0622	127.5391	123.0540	118.2321	116.3790	119.9955	123.8096	128.8717	134.4799	139.3147	(44)
Energy conte	221.2141	194.6510	204.5117	174.5947	165.6543	145.3802	140.7503	148.5795	152.6696	174.8777	191.5913	218.1331	(45)
Energy content (annual)										Total = Sum(45)m =		2132.6075	
Distribution loss (46)m = 0.15 x (45)m	33.1821	29.1976	30.6768	26.1892	24.8482	21.8070	21.1126	22.2869	22.9004	26.2317	28.7387	32.7200	(46)

Water storage loss:	
Store volume	210.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):	1.5800 (48)
Temperature factor from Table 2b	0.5400 (49)
Enter (49) or (54) in (55)	0.8532 (55)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Total storage loss	26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(56)
If cylinder contains dedicated solar storage	26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

	270.9257	239.5518	254.2233	222.7027	215.3659	193.4882	190.4619	198.2911	200.7776	224.5893	239.6993	267.8447	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	270.9257	239.5518	254.2233	222.7027	215.3659	193.4882	190.4619	198.2911	200.7776	224.5893	239.6993	267.8447	(64)
											Total per year (kWh/year) = Sum(64)m =	2717.9215	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
											Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	0.0000	(64a)
Heat gains from water heating, kWh/month													
	113.3230	100.6421	107.7694	96.5391	94.8493	86.8253	86.5688	89.1720	89.2490	97.9161	102.1905	112.2985	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	35.2685	31.3252	25.4754	19.2865	14.4169	12.1713	13.1516	17.0949	22.9447	29.1336	34.0032	36.2488	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	359.4520	363.1820	353.7825	333.7722	308.5128	284.7725	268.9125	265.1825	274.5820	294.5923	319.8517	343.5920	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	(71)
Water heating gains (Table 5)													
	152.3158	149.7650	144.8514	134.0821	127.4857	120.5907	116.3559	119.8548	123.9570	131.6077	141.9313	150.9389	(72)
Total internal gains													
	653.2794	650.5153	630.3524	593.3839	556.6585	523.7777	504.6631	508.3753	527.7268	561.5767	602.0293	637.0228	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	4.9800	16.6187	0.3000	0.0000	0.7700	19.1178	(76)
West	3.5300	16.6187	0.3000	0.0000	0.7700	13.5514	(80)

Solar gains	32.6692	67.1355	116.6090	172.9395	207.2659	216.2037	201.7650	170.7039	137.1149	82.8303	42.3057	28.7264	(83)
Total gains	685.9486	717.6508	746.9614	766.3235	763.9244	739.9813	706.4281	679.0793	664.8417	644.4070	644.3350	665.7491	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	30.7889	30.9716	30.9716	31.7246	31.5330	32.5152	32.9254	32.9254	32.5152	31.7246	31.7246	31.5330	
alpha	3.0526	3.0648	3.0648	3.1150	3.1022	3.1677	3.1950	3.1950	3.1677	3.1150	3.1150	3.1022	
util living area													
	0.9076	0.8893	0.8555	0.7783	0.6637	0.5085	0.4012	0.4240	0.6138	0.7911	0.8761	0.9127	(86)
Living	19.4724	19.6531	19.9361	20.3878	20.7157	20.9144	20.9692	20.9630	20.8310	20.4375	19.9418	19.4757	
Non living	18.8674	19.0462	19.3204	19.7636	20.0604	20.2457	20.2936	20.2899	20.1808	19.8160	19.3425	18.8828	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.2185	19.6531	19.9361	20.3878	20.7157	20.9144	20.9692	20.9630	20.8310	20.4375	19.9418	19.6889	(87)
Th 2	20.2656	20.2697	20.2697	20.2858	20.2818	20.3020	20.3102	20.3102	20.3020	20.2858	20.2858	20.2818	(88)
util rest of house													
	0.8980	0.8780	0.8404	0.7549	0.6271	0.4584	0.3429	0.3646	0.5678	0.7648	0.8618	0.9037	(89)
MIT 2	19.5503	19.0462	19.3204	19.7636	20.0604	20.2457	20.2936	20.2899	20.1808	19.8160	19.3425	19.0785	(90)
Living area fraction										fLA = Living area / (4) =		0.3196	(91)
MIT	19.7639	19.2402	19.5172	19.9631	20.2698	20.4594	20.5095	20.5050	20.3886	20.0147	19.5340	19.2736	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7639	19.2402	19.5172	19.9631	20.2698	20.4594	20.5095	20.5050	20.3886	20.0147	19.5340	19.2736	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8908	0.8595	0.8230	0.7434	0.6265	0.4700	0.3600	0.3818	0.5738	0.7539	0.8447	0.8890	(94)
Useful gains	611.0418	616.8058	614.7283	569.7172	478.5917	347.8123	254.3424	259.2418	381.4628	485.8323	544.2386	591.8804	(95)
Ext temp.	4.7000	5.3000	6.7000	9.3000	12.3000	15.0000	16.6000	16.5000	14.1000	10.8000	7.5000	4.6000	(96)
Heat loss rate W													
	1076.7501	990.5516	910.7546	739.7053	556.2338	369.5173	261.3146	267.6971	425.6384	639.2266	834.8081	1024.1033	(97)
Space heating kWh													
	346.4870	251.1572	220.2435	122.3914	57.7657	0.0000	0.0000	0.0000	0.0000	114.1253	209.2101	321.5739	(98a)
Space heating requirement - total per year (kWh/year)												1642.9541	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	346.4870	251.1572	220.2435	122.3914	57.7657	0.0000	0.0000	0.0000	0.0000	114.1253	209.2101	321.5739	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1642.9541	
Space heating per m2											(98c) / (4) =	18.0624	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)

Efficiency of main space heating system 1 (in %)												269.7489	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	346.4870	251.1572	220.2435	122.3914	57.7657	0.0000	0.0000	0.0000	0.0000	114.1253	209.2101	321.5739	(98)
Space heating efficiency (main heating system 1)													
	269.7489	269.7489	269.7489	269.7489	269.7489	0.0000	0.0000	0.0000	0.0000	269.7489	269.7489	269.7489	(210)
Space heating fuel (main heating system)													
	128.4480	93.1078	81.6476	45.3723	21.4146	0.0000	0.0000	0.0000	0.0000	42.3080	77.5573	119.2123	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	270.9257	239.5518	254.2233	222.7027	215.3659	193.4882	190.4619	198.2911	200.7776	224.5893	239.6993	267.8447	(64)
Efficiency of water heater												281.4160	(216)
(217)m	281.4160	281.4160	281.4160	281.4160	281.4160	281.4160	281.4160	281.4160	281.4160	281.4160	281.4160	281.4160	(217)
Fuel for water heating, kWh/month													
	96.2723	85.1237	90.3372	79.1365	76.5294	68.7552	67.6798	70.4619	71.3455	79.8069	85.1761	95.1775	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	29.6563	26.7864	29.6563	28.6997	29.6563	28.6997	29.6563	29.6563	28.6997	29.6563	28.6997	29.6563	(231)
Lighting	30.8703	24.7653	22.2984	16.3368	12.6190	10.3098	11.5115	14.9631	19.4355	25.5005	28.8027	31.7283	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												609.0679	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												281.4160	
Water heating fuel used												965.8020	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.1900)													
mechanical ventilation fans (SFP = 1.1900)												349.1794	(230a)
Total electricity for the above, kWh/year												349.1794	(231)
Electricity for lighting (calculated in Appendix L)												249.1413	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												2173.1906	(238)

10a. Fuel costs - using BEDF prices (583)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	609.0679	28.4300	173.1580	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	965.8020	28.4300	274.5775	(247)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(247a)
Pumps, fans and electric keep-hot	349.1794	28.4300	99.2717	(249)
Energy for lighting	249.1413	28.4300	70.8309	(250)
Additional standing charges			0.0000	(251)
Total energy cost			617.8381	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	609.0679	0.1552	94.5380	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	965.8020	0.1410	136.1404	(264)
Space and water heating			230.6784	(265)
Pumps, fans and electric keep-hot	349.1794	0.1387	48.4355	(267)
Energy for lighting	249.1413	0.1443	35.9588	(268)
Total CO2, kg/year			315.0726	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	609.0679	1.5746	959.0631	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	965.8020	1.5212	1469.2027	(278)
Space and water heating			2428.2658	(279)

Pumps, fans and electric keep-hot	349.1794	1.5128	528.2386 (281)
Energy for lighting	249.1413	1.5338	382.1413 (282)
Total Primary energy kWh/year			3338.6457 (286)

SAP 10 EPC IMPROVEMENTS

001

Current energy efficiency rating: B 84
Current environmental impact rating: A 97

N Solar water heating		Recommended
U Solar photovoltaic panels		Recommended
V2 Wind turbine		Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
N Solar water heating	+ 1.4	-£ 53	-23 kg (7.2%)
U Solar photovoltaic panels	+ 8.2	-£ 277	-207 kg (70.8%)

	Typical annual savings		Energy efficiency	Environmental impact
Recommended measures				
Solar water heating	£53	0.25 kg/m²	B 86	A 97
Solar photovoltaic panels	£277	2.27 kg/m²	A 94	A 99
Total Savings	£330	2.52 kg/m²		

Potential energy efficiency rating: A 94
Potential environmental impact rating: A 99

Fuel prices for cost data on this page from database revision number 583 TEST (01 Oct 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, West Pennines (England)):

	Current	Potential	Saving
Electricity	£618	£565	£53
Space heating	£272	£298	-£26
Water heating	£275	£196	£78
Lighting	£71	£71	£0
Generated (PV)	-£0	-£277	£277
Total cost of fuels	£618	£288	£330
Total cost of uses	£618	£288	£329
Delivered energy	24 kWh/m²	4 kWh/m²	20 kWh/m²
Carbon dioxide emissions	0.3 tonnes	0.1 tonnes	0.2 tonnes
CO2 emissions per m²	3 kg/m²	1 kg/m²	3 kg/m²
Primary energy	37 kWh/m²	16 kWh/m²	20 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	41.1800	(1b)	x 2.4800	(2b) =	102.1264	(1b) - (3b)
First floor	49.7800	(1c)	x 2.7800	(2c) =	138.3884	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	90.9600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		240.5148	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.2500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2125	(21)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													
	0.2709	0.2656	0.2603	0.2338	0.2284	0.2019	0.2019	0.1966	0.2125	0.2284	0.2391	0.2497	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	81.0000	(23c)

Effective ac	0.3659	0.3606	0.3553	0.3287	0.3234	0.2969	0.2969	0.2916	0.3075	0.3234	0.3341	0.3447	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Door			4.1400	1.0000	4.1400			(26)
Window			8.5100	0.7752	6.5969			(27)
GF			41.1800	0.0800	3.2944	75.0000	3088.5000	(28a)
Exposed Floor			8.6000	0.1400	1.2040	20.0000	172.0000	(28b)
Main	64.8536	12.6500	52.2036	0.1300	6.7865	9.0000	469.8324	(29a)
PIJ	49.7800		49.7800	0.1300	6.4714	9.0000	448.0200	(30)
Total net area of external elements Aum(A, m2)			164.4136					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	28.4932			(33)
Main dwelling								
Party Wall 1			88.2100	0.0000	0.0000	20.0000	1764.2000	(32)
Timber			96.4800			9.0000	868.3200	(32c)
FF			41.1800			18.0000	741.2400	(32d)
GF			41.1800			9.0000	370.6200	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 7922.7324	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	87.1013	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	8.6300	0.1150	0.9925
E3 Sill	8.6300	0.0170	0.1467
E4 Jamb	28.2000	0.0940	2.6508
E5 Ground floor (normal)	13.8200	0.0670	0.9259
E16 Corner (normal)	4.9600	0.0680	0.3373
E12 Gable (insulation at ceiling level)	11.0000	0.0770	0.8470
E6 Intermediate floor within a dwelling	11.0000	0.0320	0.3520
E17 Corner (inverted - internal area greater than external area)	4.9600	-0.0290	-0.1438
P1 Party wall - Ground floor	15.2800	0.3200	4.8896
E20 Exposed floor (normal)	6.4400	0.0790	0.5088
E21 Exposed floor (inverted)	12.0800	0.0630	0.7610
E18 Party wall between dwellings	21.0400	0.0920	1.9357
P4 Party wall - Roof (insulation at ceiling level)	18.1000	0.1020	1.8462

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		16.0496 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	44.5428 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	29.0444	28.6228	28.2011	26.0928	25.6712	23.5629	23.5629	23.1413	24.4062	25.6712	26.5145	27.3578	(38)
Heat transfer coeff													
	73.5872	73.1656	72.7439	70.6356	70.2140	68.1057	68.1057	67.6841	68.9490	70.2140	71.0573	71.9006	(39)
Average = Sum(39)m / 12 =												70.5302	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8090	0.8044	0.7997	0.7766	0.7719	0.7487	0.7487	0.7441	0.7580	0.7719	0.7812	0.7905	(40)
HLP (average)												0.7754	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.6386	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
68.4610	67.4321	65.9329	63.0644	60.9476	58.5869	57.2450	58.7329	60.3639	62.8986	65.8287	68.1987	(42a)

Hot water usage for baths

29.5637	29.1246	28.5063	27.3663	26.5127	25.5661	25.0549	25.6688	26.3373	27.3502	28.5137	29.4637	(42b)

Hot water usage for other uses

41.6522	40.1376	38.6230	37.1084	35.5937	34.0791	34.0791	35.5937	37.1084	38.6230	40.1376	41.6522	(42c)

Average daily hot water use (litres/day)	128.3946	(43)

Daily hot water use

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
139.6769	136.6944	133.0622	127.5391	123.0540	118.2321	116.3790	119.9955	123.8096	128.8717	134.4799	139.3147	(44)
Energy conte 221.2141	194.6510	204.5117	174.5947	165.6543	145.3802	140.7503	148.5795	152.6696	174.8777	191.5913	218.1331	(45)

Energy content (annual) Total = Sum(45)m =	2132.6075	
Distribution loss (46)m = 0.15 x (45)m		
33.1821 29.1976 30.6768 26.1892 24.8482 21.8070 21.1126 22.2869 22.9004 26.2317 28.7387 32.7200		(46)
Water storage loss:		
Store volume	210.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):	1.5800	(48)
Temperature factor from Table 2b	0.5400	(49)
Enter (49) or (54) in (55)	0.8532	(55)
Total storage loss		
26.4492 23.8896 26.4492 25.5960 26.4492 25.5960 26.4492 26.4492 25.5960 26.4492 25.5960 26.4492		(56)
If cylinder contains dedicated solar storage		
17.0031 15.3576 17.0031 16.4546 17.0031 16.4546 17.0031 17.0031 16.4546 17.0031 16.4546 17.0031		(57)
Primary loss 23.2624 21.0112 21.8667 15.7584 10.4681 9.9053 10.2355 11.1660 17.1091 21.8667 22.5120 23.2624		(59)
Combi loss 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000		(61)
Total heat required for water heating calculated for each month		
261.4795 231.0198 243.3814 206.8077 193.1255 171.7400 167.9889 176.7485 186.2333 213.7474 230.5579 258.3985		(62)
WWHRS 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000		(63a)
PV diverter -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000		(63b)
Aperture area of solar collector	3.0000	(H1)
Zero-loss collector efficiency	0.8000	(H2)
Collector linear heat loss coefficient	1.8000	(H3)
Collector 2nd order heat loss coefficient	0.0000	(H4)
Collector loop efficiency	0.9000	(H5)
Incidence angle modifier	1.0000	(H6)
Overshading factor	0.8000	(H8)
Overall heat loss coefficient of system	6.5000	(H10)
Heat loss coefficient of collector loop	3.9667	(H11)

Dedicated solar storage volume												75.0000	(H12)
If combined cylinder, total volume of cylinder												210.0000	(H13)
Effective solar volume												115.5000	(H14)
Reference volume												225.0000	(H15)
Storage tank correction coefficient												1.1814	(H16)
Heat delivered to hot water												654.6757	(H24)
Heat delivered to space heating												0.0000	(H29)
Solar input												654.6757	
Solar input	-0.0000	-20.1906	-62.4438	-83.8682	-107.6151	-99.0457	-98.2732	-86.8675	-61.6791	-33.2791	-1.4133	-0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	261.4795	210.8291	180.9377	122.9394	85.5104	72.6943	69.7156	89.8809	124.5542	180.4683	229.1446	258.3985	(64)
									Total per year (kWh/year) = Sum(64)m =			1886.5527	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month													
	105.7660	93.8165	99.0959	83.8231	77.0570	69.4268	68.5903	71.9379	77.6136	89.2426	94.8774	104.7416	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	35.2685	31.3252	25.4754	19.2865	14.4169	12.1713	13.1516	17.0949	22.9447	29.1336	34.0032	36.2488	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	359.4520	363.1820	353.7825	333.7722	308.5128	284.7725	268.9125	265.1825	274.5820	294.5923	319.8517	343.5920	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	(71)
Water heating gains (Table 5)													
	142.1587	139.6079	133.1934	116.4210	103.5712	96.4261	92.1913	96.6907	107.7967	119.9497	131.7741	140.7817	(72)
Total internal gains													
	643.1223	640.3582	618.6944	575.7228	532.7440	499.6131	480.4985	485.2112	511.5665	549.9188	591.8722	626.8656	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	4.9800	19.6403	0.3000	0.0000	0.7700	22.5938	(76)
West	3.5300	19.6403	0.3000	0.0000	0.7700	16.0153	(80)

Solar gains	38.6090	75.5274	124.3829	181.4051	222.3188	227.5828	216.6681	186.1147	144.6625	89.6197	48.1409	31.7502	(83)
Total gains	681.7313	715.8856	743.0774	757.1279	755.0628	727.1959	697.1666	671.3260	656.2290	639.5384	640.0131	658.6158	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	29.9068	30.0792	30.2535	31.1565	31.3436	32.3139	32.3139	32.5152	31.9186	31.3436	30.9716	30.6084	
alpha	2.9938	3.0053	3.0169	3.0771	3.0896	3.1543	3.1543	3.1677	3.1279	3.0896	3.0648	3.0406	
util living area													
	0.9157	0.8984	0.8640	0.7984	0.6982	0.5451	0.4122	0.4410	0.6258	0.8030	0.8876	0.9213	(86)
Living	19.3145	19.5061	19.8448	20.2926	20.6435	20.8871	20.9649	20.9562	20.8144	20.3863	19.8161	19.3108	
Non living	18.6981	18.8880	19.2203	19.6648	19.9931	20.2209	20.2792	20.2776	20.1566	19.7621	19.2087	18.7064	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.1378	19.5061	19.8448	20.2926	20.6435	20.8871	20.9649	20.9562	20.8144	20.3863	19.8161	19.5471	(87)
Th 2	20.2455	20.2495	20.2536	20.2737	20.2777	20.2980	20.2980	20.3020	20.2899	20.2777	20.2697	20.2616	(88)
util rest of house													
	0.9069	0.8878	0.8496	0.7766	0.6646	0.4966	0.3518	0.3807	0.5791	0.7779	0.8746	0.9131	(89)
MIT 2	19.4539	18.8880	19.2203	19.6648	19.9931	20.2209	20.2792	20.2776	20.1566	19.7621	19.2087	18.9240	(90)
Living area fraction										fLA = Living area / (4) =		0.3196	(91)
MIT	19.6725	19.0856	19.4199	19.8655	20.2010	20.4338	20.4983	20.4945	20.3668	19.9616	19.4028	19.1231	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6725	19.0856	19.4199	19.8655	20.2010	20.4338	20.4983	20.4945	20.3668	19.9616	19.4028	19.1231	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8995	0.8687	0.8313	0.7632	0.6608	0.5063	0.3694	0.3977	0.5844	0.7657	0.8566	0.8983	(94)
Useful gains	613.1837	621.9176	617.6904	577.8741	498.9600	368.1690	257.5291	267.0090	383.4943	489.7138	548.2439	591.6221	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1131.2183	1037.8938	939.8427	774.5522	596.8894	397.3137	265.4963	277.1319	432.0910	657.3130	874.2039	1072.9796	(97)
Space heating kWh													
	385.4178	279.5360	239.6813	141.6082	72.8594	0.0000	0.0000	0.0000	0.0000	124.6938	234.6911	358.1300	(98a)
Space heating requirement - total per year (kWh/year)												1836.6177	
Solar heating kWh													
	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	385.4178	279.5360	239.6813	141.6082	72.8594	0.0000	0.0000	0.0000	0.0000	124.6938	234.6911	358.1300	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1836.6177	
Space heating per m2											(98c) / (4) =	20.1915	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												270.7081	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	385.4178	279.5360	239.6813	141.6082	72.8594	0.0000	0.0000	0.0000	0.0000	124.6938	234.6911	358.1300	(98)
Space heating efficiency (main heating system 1)													
	270.7081	270.7081	270.7081	270.7081	270.7081	0.0000	0.0000	0.0000	0.0000	270.7081	270.7081	270.7081	(210)
Space heating fuel (main heating system)													
	142.3739	103.2610	88.5386	52.3103	26.9144	0.0000	0.0000	0.0000	0.0000	46.0621	86.6953	132.2938	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	261.4795	210.8291	180.9377	122.9394	85.5104	72.6943	69.7156	89.8809	124.5542	180.4683	229.1446	258.3985	(64)
Efficiency of water heater												281.1060	(216)
(217)m	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	(217)
Fuel for water heating, kWh/month													
	93.0181	74.9999	64.3663	43.7342	30.4193	25.8601	24.8005	31.9740	44.3086	64.1994	81.5154	91.9221	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	36.4509	32.9233	36.4509	35.2750	36.4509	35.2750	36.4509	36.4509	35.2750	36.4509	35.2750	36.4509	(231)
Lighting	30.8703	24.7653	22.2984	16.3368	12.6190	10.3098	11.5115	14.9631	19.4355	25.5005	28.8027	31.7283	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-37.4126	-55.2815	-82.5768	-94.8457	-102.3112	-93.2996	-92.1870	-86.5589	-76.2048	-63.7088	-41.7331	-31.9441	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-12.6739	-28.2985	-59.7695	-95.9263	-133.3716	-138.4141	-136.4645	-113.2151	-80.2583	-43.1370	-17.6767	-9.9697	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	678.4495	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	281.1060	
Water heating fuel used	671.1179	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.1900)		
mechanical ventilation fans (SFP = 1.1900)	349.1794	(230a)
pump for solar water heating	80.0000	(230g)
Total electricity for the above, kWh/year	429.1794	(231)
Electricity for lighting (calculated in Appendix L)	249.1413	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1727.2394	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	300.6487	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	678.4495	16.4900	111.8763	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	671.1179	16.4900	110.6673	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	349.1794	16.4900	57.5797	(249)
Pump for solar water heating	80.0000	16.4900	13.1920	(249)
Energy for lighting	249.1413	16.4900	41.0834	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-858.0643	16.4900	-141.4948	
PV Unit electricity exported	-869.1751	5.5900	-48.5869	
Total			-190.0817	(252)
Total energy cost			144.3171	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.3821	(257)
SAP value		93.8057	
SAP rating (Section 12)		94	(258)
SAP band		A	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	678.4495	0.1551	105.2275	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	671.1179	0.1462	98.1454	(264)
Space and water heating			203.3729	(265)
Pumps, fans and electric keep-hot	429.1794	0.1387	59.5325	(267)
Energy for lighting	249.1413	0.1443	35.9588	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-858.0643	0.1343	-115.2389	
PV Unit electricity exported	-869.1751	0.1239	-107.6905	
Total			-222.9293	(269)
Total CO2, kg/year			75.9348	(272)
CO2 emissions per m2			0.8300	(273)
EI value			99.2516	
EI rating			99	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	41.1800	(1b) x	2.4800	(2b) =	102.1264	(1b) - (3b)
First floor	49.7800	(1c) x	2.7800	(2c) =	138.3884	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	90.9600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		240.5148	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.2500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2125	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.6000	4.5000	4.5000	4.1000	4.2000	3.7000	3.5000	3.5000	3.7000	4.1000	4.1000	4.2000	(22)
Wind factor	1.1500	1.1250	1.1250	1.0250	1.0500	0.9250	0.8750	0.8750	0.9250	1.0250	1.0250	1.0500	(22a)
Adj infilt rate	0.2444	0.2391	0.2391	0.2178	0.2231	0.1966	0.1859	0.1859	0.1966	0.2178	0.2178	0.2231	(22b)
Balanced mechanical ventilation with heat recovery													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												81.0000	(23c)
Effective ac	0.3394	0.3341	0.3341	0.3128	0.3181	0.2916	0.2809	0.2809	0.2916	0.3128	0.3128	0.3181	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door			4.1400	1.0000	4.1400			(26)
Window			8.5100	0.7752	6.5969			(27)
GF			41.1800	0.0800	3.2944	75.0000	3088.5000	(28a)
Exposed Floor			8.6000	0.1400	1.2040	20.0000	172.0000	(28b)
Main	64.8536	12.6500	52.2036	0.1300	6.7865	9.0000	469.8324	(29a)
PIJ	49.7800		49.7800	0.1300	6.4714	9.0000	448.0200	(30)
Total net area of external elements Aum(A, m2)			164.4136					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		28.4932			(33)
Main dwelling								
Party Wall 1			88.2100	0.0000	0.0000	20.0000	1764.2000	(32)
Timber			96.4800			9.0000	868.3200	(32c)
FF			41.1800			18.0000	741.2400	(32d)
GF			41.1800			9.0000	370.6200	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		7922.7324	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							87.1013	(35)
List of Thermal Bridges								
K1 Element				Length	Psi-value	Total		

E2 Other lintels (including other steel lintels)	8.6300	0.1150	0.9925	
E3 Sill	8.6300	0.0170	0.1467	
E4 Jamb	28.2000	0.0940	2.6508	
E5 Ground floor (normal)	13.8200	0.0670	0.9259	
E16 Corner (normal)	4.9600	0.0680	0.3373	
E12 Gable (insulation at ceiling level)	11.0000	0.0770	0.8470	
E6 Intermediate floor within a dwelling	11.0000	0.0320	0.3520	
E17 Corner (inverted - internal area greater than external area)	4.9600	-0.0290	-0.1438	
P1 Party wall - Ground floor	15.2800	0.3200	4.8896	
E20 Exposed floor (normal)	6.4400	0.0790	0.5088	
E21 Exposed floor (inverted)	12.0800	0.0630	0.7610	
E18 Party wall between dwellings	21.0400	0.0920	1.9357	
P4 Party wall - Roof (insulation at ceiling level)	18.1000	0.1020	1.8462	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 16.0496 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 44.5428 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	26.9362	26.5145	26.5145	24.8279	25.2495	23.1413	22.2980	22.2980	23.1413	24.8279	24.8279	25.2495	(38)
Heat transfer coeff	71.4789	71.0573	71.0573	69.3707	69.7923	67.6841	66.8408	66.8408	67.6841	69.3707	69.3707	69.7923	(39)

Average = Sum(39)m / 12 = 69.1950

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7858	0.7812	0.7812	0.7627	0.7673	0.7441	0.7348	0.7348	0.7441	0.7627	0.7627	0.7673	(40)
HLP (average)												0.7607	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6386 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
68.4610	67.4321	65.9329	63.0644	60.9476	58.5869	57.2450	58.7329	60.3639	62.8986	65.8287	68.1987	(42a)

Hot water usage for baths

29.5637	29.1246	28.5063	27.3663	26.5127	25.5661	25.0549	25.6688	26.3373	27.3502	28.5137	29.4637	(42b)

Hot water usage for other uses

41.6522	40.1376	38.6230	37.1084	35.5937	34.0791	34.0791	35.5937	37.1084	38.6230	40.1376	41.6522	(42c)

Average daily hot water use (litres/day) 128.3946 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	139.6769	136.6944	133.0622	127.5391	123.0540	118.2321	116.3790	119.9955	123.8096	128.8717	134.4799	139.3147	(44)
Energy conte	221.2141	194.6510	204.5117	174.5947	165.6543	145.3802	140.7503	148.5795	152.6696	174.8777	191.5913	218.1331	(45)
Energy content (annual)										Total = Sum(45)m =		2132.6075	
Distribution loss (46)m = 0.15 x (45)m	33.1821	29.1976	30.6768	26.1892	24.8482	21.8070	21.1126	22.2869	22.9004	26.2317	28.7387	32.7200	(46)

Water storage loss:
Store volume 210.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.5800 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.8532 (55)
Total storage loss

26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(56)

If cylinder contains dedicated solar storage

17.0031	15.3576	17.0031	16.4546	17.0031	16.4546	17.0031	17.0031	16.4546	17.0031	16.4546	17.0031	(57)
Primary loss 23.2624	21.0112	21.8667	15.7584	10.4681	9.9053	10.2355	11.1660	17.1091	21.8667	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

261.4795	231.0198	243.3814	206.8077	193.1255	171.7400	167.9889	176.7485	186.2333	213.7474	230.5579	258.3985	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)

Aperture area of solar collector 3.0000 (H1)
Zero-loss collector efficiency 0.8000 (H2)
Collector linear heat loss coefficient 1.8000 (H3)
Collector 2nd order heat loss coefficient 0.0000 (H4)
Collector loop efficiency 0.9000 (H5)
Incidence angle modifier 1.0000 (H6)
Overshading factor 0.8000 (H8)
Overall heat loss coefficient of system 6.5000 (H10)
Heat loss coefficient of collector loop 3.9667 (H11)
Dedicated solar storage volume 75.0000 (H12)
If combined cylinder, total volume of cylinder 210.0000 (H13)
Effective solar volume 115.5000 (H14)
Reference volume 225.0000 (H15)
Storage tank correction coefficient 1.1814 (H16)
Heat delivered to hot water 599.1897 (H24)
Heat delivered to space heating 0.0000 (H29)
Solar input 599.1897

Solar input -0.0000	-14.4822	-56.8249	-79.3403	-100.2904	-94.0949	-90.8995	-78.3168	-56.9604	-27.9802	-0.0000	-0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

261.4795	216.5376	186.5565	127.4673	92.8350	77.6451	77.0894	98.4317	129.2728	185.7672	230.5579	258.3985	(64)
							Total per year (kWh/year) = Sum(64)m =				1942.0387	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
							Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =				0.0000	(64a)

Heat gains from water heating, kWh/month

105.7660	93.8165	99.0959	83.8231	77.0570	69.4268	68.5903	71.9379	77.6136	89.2426	94.8774	104.7416	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	35.2685	31.3252	25.4754	19.2865	14.4169	12.1713	13.1516	17.0949	22.9447	29.1336	34.0032	36.2488	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	359.4520	363.1820	353.7825	333.7722	308.5128	284.7725	268.9125	265.1825	274.5820	294.5923	319.8517	343.5920	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)	
Losses e.g. evaporation (negative values) (Table 5)	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	(71)
Water heating gains (Table 5)													

	142.1587	139.6079	133.1934	116.4210	103.5712	96.4261	92.1913	96.6907	107.7967	119.9497	131.7741	140.7817	(72)
Total internal gains	643.1223	640.3582	618.6944	575.7228	532.7440	499.6131	480.4985	485.2112	511.5665	549.9188	591.8722	626.8656	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	4.9800	16.6187	0.3000	0.0000	0.7700	19.1178	(76)
West	3.5300	16.6187	0.3000	0.0000	0.7700	13.5514	(80)

Solar gains	32.6692	67.1355	116.6090	172.9395	207.2659	216.2037	201.7650	170.7039	137.1149	82.8303	42.3057	28.7264	(83)
Total gains	675.7915	707.4937	735.3035	748.6623	740.0099	715.8167	682.2635	655.9152	648.6814	632.7491	634.1778	655.5920	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	30.7889	30.9716	30.9716	31.7246	31.5330	32.5152	32.9254	32.9254	32.5152	31.7246	31.7246	31.5330	
alpha	3.0526	3.0648	3.0648	3.1150	3.1022	3.1677	3.1950	3.1950	3.1677	3.1150	3.1150	3.1022	
util living area	0.9105	0.8925	0.8598	0.7866	0.6771	0.5223	0.4139	0.4372	0.6245	0.7975	0.8800	0.9156	(86)
Living	19.4520	19.6341	19.9169	20.3665	20.6987	20.9076	20.9663	20.9596	20.8224	20.4227	19.9237	19.4549	
Non living	18.8477	19.0280	19.3024	19.7444	20.0463	20.2410	20.2920	20.2879	20.1742	19.8028	19.3253	18.8626	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.2081	19.6341	19.9169	20.3665	20.6987	20.9076	20.9663	20.9596	20.8224	20.4227	19.9237	19.6710	(87)
Th 2	20.2656	20.2697	20.2697	20.2858	20.2818	20.3020	20.3102	20.3102	20.3020	20.2858	20.2858	20.2818	(88)
util rest of house	0.9012	0.8814	0.8451	0.7637	0.6407	0.4716	0.3542	0.3765	0.5784	0.7716	0.8661	0.9068	(89)
MIT 2	19.5403	19.0280	19.3024	19.7444	20.0463	20.2410	20.2920	20.2879	20.1742	19.8028	19.3253	19.0611	(90)
Living area fraction										fLA = Living area / (4) =		0.3196	(91)
MIT	19.7537	19.2217	19.4988	19.9432	20.2548	20.4541	20.5075	20.5026	20.3813	20.0009	19.5165	19.2560	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7537	19.2217	19.4988	19.9432	20.2548	20.4541	20.5075	20.5026	20.3813	20.0009	19.5165	19.2560	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8940	0.8630	0.8275	0.7517	0.6393	0.4830	0.3716	0.3938	0.5839	0.7603	0.8489	0.8923	(94)
Useful gains	604.1499	610.5443	608.4308	562.7679	473.0604	345.7264	253.5441	258.2962	378.7460	481.0579	538.3296	584.9821	(95)
Ext temp.	4.7000	5.3000	6.7000	9.3000	12.3000	15.0000	16.6000	16.5000	14.1000	10.8000	7.5000	4.6000	(96)
Heat loss rate W	1076.0231	989.2387	909.4455	738.3266	555.1862	369.1525	261.1787	267.5356	425.1462	638.2757	833.5944	1022.8793	(97)
Space heating kWh	351.0737	254.4826	223.9550	126.4022	61.1016	0.0000	0.0000	0.0000	0.0000	116.9700	212.5906	325.7955	(98a)
Space heating requirement - total per year (kWh/year)												1672.3713	
Solar heating kWh	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	351.0737	254.4826	223.9550	126.4022	61.1016	0.0000	0.0000	0.0000	0.0000	116.9700	212.5906	325.7955	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1672.3713	
Space heating per m2											(98c) / (4) =	18.3858	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												269.7489	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	351.0737	254.4826	223.9550	126.4022	61.1016	0.0000	0.0000	0.0000	0.0000	116.9700	212.5906	325.7955	(98)
Space heating efficiency (main heating system 1)	269.7489	269.7489	269.7489	269.7489	269.7489	0.0000	0.0000	0.0000	0.0000	269.7489	269.7489	269.7489	(210)
Space heating fuel (main heating system)	130.1483	94.3406	83.0235	46.8592	22.6513	0.0000	0.0000	0.0000	0.0000	43.3626	78.8106	120.7773	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	261.4795	216.5376	186.5565	127.4673	92.8350	77.6451	77.0894	98.4317	129.2728	185.7672	230.5579	258.3985	(64)
Efficiency of water heater												281.4160	(216)
(217)m	281.4160	281.4160	281.4160	281.4160	281.4160	281.4160	281.4160	281.4160	281.4160	281.4160	281.4160	281.4160	(217)
Fuel for water heating, kWh/month	92.9156	76.9457	66.2921	45.2950	32.9885	27.5909	27.3934	34.9773	45.9366	66.0116	81.9278	91.8208	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	36.4509	32.9233	36.4509	35.2750	36.4509	35.2750	36.4509	36.4509	35.2750	36.4509	35.2750	36.4509	(231)
Lighting	30.8703	24.7653	22.2984	16.3368	12.6190	10.3098	11.5115	14.9631	19.4355	25.5005	28.8027	31.7283	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-32.3272	-50.1980	-78.6403	-91.6477	-98.0326	-90.9865	-89.0327	-82.6495	-73.7822	-60.0630	-37.4118	-29.2154	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)

Electricity generated by PVs (Appendix M) (negative quantity)

(233b)m	-10.0537	-24.0953	-54.8093	-90.2216	-121.6925	-129.1415	-123.8914	-100.5827	-74.5176	-38.6885	-14.7968	-8.7066	(233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	619.9733	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	281.4160	
Water heating fuel used	690.0953	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.1900)		
mechanical ventilation fans (SFP = 1.1900)	349.1794	(230a)
pump for solar water heating	80.0000	(230g)
Total electricity for the above, kWh/year	429.1794	(231)
Electricity for lighting (calculated in Appendix L)	249.1413	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1605.1846	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	383.2047	(238)

10a. Fuel costs - using BEDF prices (583)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	619.9733	28.4300	176.2584	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	690.0953	28.4300	196.1941	(247)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(247a)
Pumps, fans and electric keep-hot	349.1794	28.4300	99.2717	(249)
Pump for solar water heating	80.0000	28.4300	22.7440	(249)
Energy for lighting	249.1413	28.4300	70.8309	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-813.9870	28.4300	-231.4165	
PV Unit electricity exported	-791.1976	5.8100	-45.9686	
Total			-277.3851	(252)
Total energy cost			287.9140	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	619.9733	0.1551	96.1865	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	690.0953	0.1458	100.6197	(264)
Space and water heating			196.8062	(265)
Pumps, fans and electric keep-hot	429.1794	0.1387	59.5325	(267)
Energy for lighting	249.1413	0.1443	35.9588	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-813.9870	0.1339	-109.0180	
PV Unit electricity exported	-791.1976	0.1237	-97.8355	
Total			-206.8535	(269)
Total CO2, kg/year			85.4440	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	619.9733	1.5744	976.0710	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	690.0953	1.5394	1062.3003	(278)
Space and water heating			2038.3713	(279)
Pumps, fans and electric keep-hot	429.1794	1.5128	649.2626	(281)
Energy for lighting	249.1413	1.5338	382.1413	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-813.9870	1.4950	-1216.8829	
PV Unit electricity exported	-791.1976	0.4538	-359.0721	
Total			-1575.9549	(283)
Total Primary energy kWh/year			1493.8202	(286)

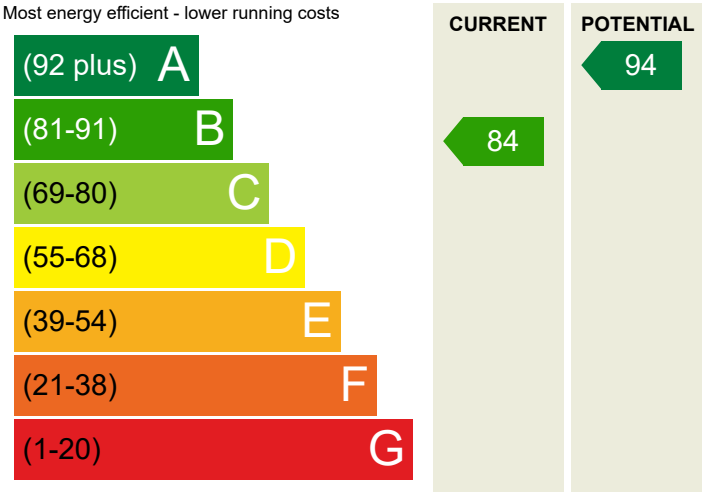
Energy Report

Dwelling Address	852 Rochdale Road, MANCHESTER, M9 8FA
Reference	78449-02-001
Assessment Date	02/07/2025
Submission Date	
Property Type	House, Mid-Terrace
Total Floor Area	91

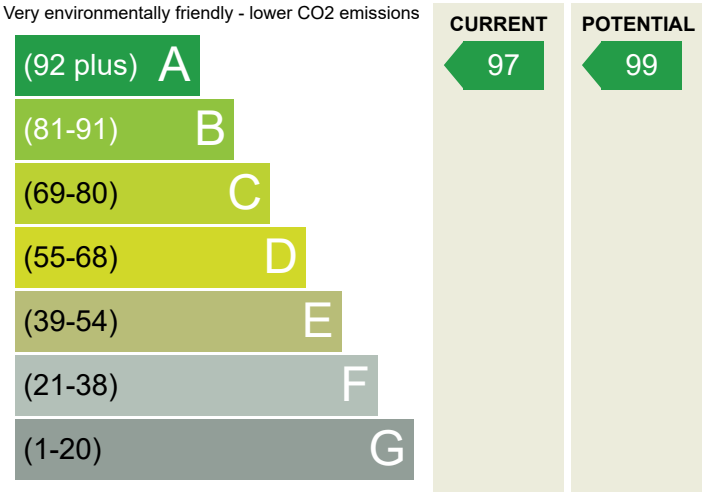
This Energy Report has been generated using the UK's National Calculation Methodology for dwellings, Standard Assessment Procedure (SAP). This methodology is used to assess the energy efficiency of dwellings which is calculated based on a dwelling's heating, hot water, ventilation and lighting usage.

This document is not an Energy Performance Certificate (EPC) as required by the Energy Performance of Buildings Regulations

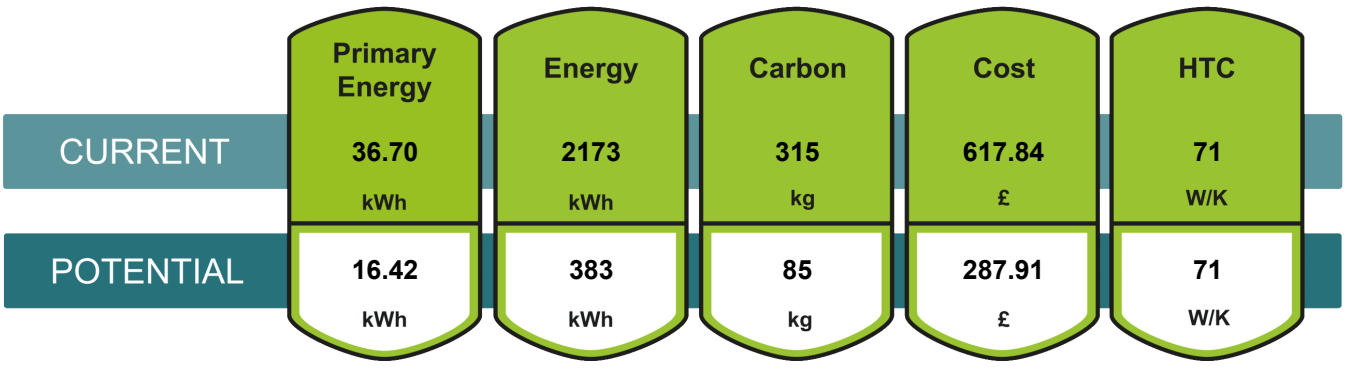
Energy Efficiency Rating



Carbon Dioxide (CO2) Emissions Rating



Additional ratings for your home



Energy Report

Breakdown of property's energy performance

Each feature is assessed as one of the following:

Very Poor | Poor | Average | Good | Very Good

Feature	Description	Energy Performance
Walls	Average thermal transmittance 0.13 W/m²K	Very Good
Roof	Average thermal transmittance 0.13 W/m²K	Very Good
Floor	Average thermal transmittance 0.09 W/m²K	Very Good
Windows	High performance glazing	Very Good
Main heating	Air source heat pump, radiators, electric	Good
Main heating controls	Programmer, room thermostat and TRVs	Good
Secondary heating	None	
Hot water	From main system	Good
Lighting	Good lighting efficiency	Good
Air tightness	Air permeability [AP50] = 5.0 m³/h.m² (as tested)	Good

Recommendations

The recommended measures provided below will help to improve the energy efficiency of the dwelling.
To reach the dwelling's potential energy rating all of the recommended measures shown below would need to be installed.
Having these measures installed individually or in any other order may give a different result when compared with the cumulative potential rating.

Recommended measures	Cumulative savings (per year)	Cumulative rating	Typical costs	Incremental savings (per year)	Cumulative CO2 rating
Solar water heating	£53	B 86	£4,000 - £7,000	£53	A 97
Photovoltaic	£330	A 94	£8,000 - £10,000	£277	A 99

Energy Report

The typical cost is based on average installation prices across the country so may not be representative of the actual costs in your area.

Estimated energy costs of the dwelling

The table below shows the estimated running costs of the space and water heating and lighting within the dwelling. It does not include the energy used from household appliances. The estimated annual costs after potential improvements indicates the total energy cost if all recommended measures named above were installed.

	Estimated annual costs	Estimated annual costs after potential improvements	Potential future savings
Lighting	£71	£71	
Heating	£272	£298	
Hot Water	£275	£196	
New Technologies e.g. Impact of PV	£0	-(£277)	
TOTAL	£618	£288	

Estimated energy use and potential savings

Space Heating
609
kWh per year

Water Heating
966
kWh per year

Energy Report

About this document

Created by:	
Company/Trading name:	
Phone number:	
Email address:	

Disclaimer

This Energy Report should not under any circumstances be treated as a Condition Survey and cannot be used to indicate that any element of the dwelling (e.g.heating system) is working correctly.
This Energy Report must not be used in situations where an Energy Performance Certificate (EPC) is required.
This Energy Report is generated from a set of data inputs which may not reflect the actual dimensions, services or construction of the dwelling.
The calculation used to generate this report reflects the SAP Methodology current at the time of report generation.

Glossary terms for additional metrics

Primary Energy	The measure of the energy required for lighting, heating and hot water in a property. This includes the efficiency of the property's heating system, power station efficiency for electricity and the energy used to produce the fuel and deliver it to the property.
Energy Used	The estimated amount of fuel energy for lighting, heating and hot water for the property. The estimate is based on typical usage which is likely to be different to actual consumption.
Carbon (CO2)	The current emissions based on the energy estimates.
Cost	The estimated cost of energy. The cost of each unit of fuel is based on an industry standard which is likely to be different to those the occupier actually pays.
Heat Transfer Coefficient	Heat flow through the property envelope where internal and external temperatures are different.

Building Regulations England Part L (BREL) Compliance Report

Approved Document L1 2021 Edition, England assessed by Array SAP 10 program, Array

Date: Fri 03 Oct 2025 15:03:26

Project Information			
Assessed By	Paul Goddard	Building Type	House, Mid-terrace
OCDEA Registration	EES/005113	Assessment Date	2025-10-03

Dwelling Details			
Assessment Type	As built	Total Floor Area	91 m^2
Site Reference	78449-03	Plot Reference	001
Address	850 Rochdale Road, MANCHESTER, M9 8FA		

Client Details	
Name	-
Company	John Southworth
Address	Unit 10, Charles Street, DUKINFIELD, SK16 4SD

This report covers items included within the SAP calculations. It is not a complete report of regulations compliance.

1a Target emission rate and dwelling emission rate		
Fuel for main heating system	Electricity	
Target carbon dioxide emission rate	*11.59 $kgCO_2/m^2$*	
Dwelling carbon dioxide emission rate	3.63 $kgCO_2/m^2$	**OK**
1b Target primary energy rate and dwelling primary energy		
Target primary energy	*60.76 kWh_{PE}/m^2*	
Dwelling primary energy	38.42 kWh_{PE}/m^2	**OK**
1c Target fabric energy efficiency and dwelling fabric energy efficiency		
Target fabric energy efficiency	*37.6 kWh/m^2*	
Dwelling fabric energy efficiency	34.2 kWh/m^2	**OK**

2a Fabric U-values				
Element	***Maximum permitted average U-Value [W/m^2K]***	**Dwelling average U-Value [W/m^2K]**	**Element with highest individual U-Value**	
External walls	*0.26*	0.13	Walls (1) (0.13)	**OK**
Party walls	*0.2*	0	Party Wall (1) (0)	**N/A**
Curtain walls	*1.6*	0	N/A	**N/A**
Floors	*0.18*	0.1	Exposed Floor (0.14)	**OK**
Roofs	*0.16*	0.13	Roof (1) (0.13)	**OK**
Windows, doors, and roof windows	*1.6*	0.87	Front (1)	**OK**
Rooflights	*2.2*	N/A	N/A	**N/A**

2b Envelope elements (better than typically expected values are flagged with a subsequent (!))		
Name	**Net area [m^2]**	**U-Value [W/m^2K]**
Exposed wall: Walls (1)	59.2	0.13 **(!)**
Party wall: Party Wall (1)	81.22	0 **(!)**
Ground floor: GF, GF	41.18	0.09 **(!)**
Upper floor: Exposed Floor, Exposed Floor	8.6	0.14
Exposed roof: Roof (1)	49.779998779296875	0.13

2c Openings (better than typically expected values are flagged with a subsequent (!))				
Name	**Area [m^2]**	**Orientation**	**Frame factor**	**U-Value [W/m^2K]**
Front, Door	1.99	East	N/A	1 **(!)**
Front, Window	4.98	East	1.0	0.8 **(!)**
Rear, Window	3.53	West	1.0	0.8 **(!)**
Rear, Door	2.15	West	N/A	1 **(!)**

2d Thermal bridging (better than typically expected values are flagged with a subsequent (!))				
Building part **1**: Thermal bridging calculated from linear thermal transmittances for each junction				
Main element	**Junction detail**	**Source**	**Psi value [W/mK]**	**Drawing / reference**
External wall	E2: Other lintels (including other steel lintels)	Calculated by person with suitable expertise	0.115	Thermal Bridge Report

Main element	Junction detail	Source	Psi value [W/mK]	Drawing / reference
External wall	E3: Sill	Calculated by person with suitable expertise	0.017 **(!)**	Thermal Bridge Report
External wall	E4: Jamb	Calculated by person with suitable expertise	0.094	Thermal Bridge Report
External wall	E5: Ground floor (normal)	Calculated by person with suitable expertise	0.067	Thermal Bridge Report
External wall	E16: Corner (normal)	Calculated by person with suitable expertise	0.068	Thermal Bridge Report
External wall	E12: Gable (insulation at ceiling level)	Calculated by person with suitable expertise	0.077	Thermal Bridge Report
External wall	E6: Intermediate floor within a dwelling	Calculated by person with suitable expertise	0.032 **(!)**	Thermal Bridge Report
External wall	E17: Corner (inverted - internal area greater than external area)	Calculated by person with suitable expertise	-0.029 **(!)**	Thermal Bridge Report
Party wall	P1: Ground floor	SAP table default	0.32	K1
External wall	E20: Exposed floor (normal)	Calculated by person with suitable expertise	0.079	Thermal Bridge Report
External wall	E21: Exposed floor (inverted)	Calculated by person with suitable expertise	0.063	Thermal Bridge Report
External wall	E18: Party wall between dwellings	Calculated by person with suitable expertise	0.092	Thermal Bridge Report
Party wall	P4: Roof (insulation at ceiling level)	Calculated by person with suitable expertise	0.102	Thermal Bridge Report
External wall	E25: Staggered party wall between dwellings	Calculated by person with suitable expertise	0.056	Thermal Bridge Report

3 Air permeability (better than typically expected values are flagged with a subsequent (!))		
Maximum permitted air permeability at 50Pa	*8 m^3/hm^2*	
Dwelling air permeability at 50Pa	5 m^3/hm^2, Measured value	OK
Air permeability test certificate reference		

4 Space heating	
Main heating system 1: Heat pump with radiators or underfloor heating - Electricity	
Efficiency	270.9%
Emitter type	Radiators
Flow temperature	45°C
System type	
Manufacturer	Daikin Europe NV
Model	EDLA09DA3V3
Commissioning	
Secondary heating system: N/A	
Fuel	N/A
Efficiency	N/A
Commissioning	

5 Hot water	
Cylinder/store - type: Cylinder	
Capacity	210 litres
Declared heat loss	1.58 kWh/day
Primary pipework insulated	Yes
Manufacturer	
Model	
Commissioning	
Waste water heat recovery system 1 - type: N/A	
Efficiency	
Manufacturer	
Model	

6 Controls	
Main heating 1 - type: Programmer, room thermostat and TRVs	
Function	
Ecodesign class	
Manufacturer	
Model	

Water heating - type: Cylinder thermostat and HW separately timed	
Manufacturer	
Model	

7 Lighting		
Minimum permitted light source efficacy	*75 lm/W*	
Lowest light source efficacy	80 lm/W	OK
External lights control	N/A	

8 Mechanical ventilation		
System type: Balanced whole-house mechanical ventilation with heat recovery		
Maximum permitted specific fan power	*1.5 W/(l/s)*	
Specific fan power	0.85 W/(l/s)	OK
Minimum permitted heat recovery efficiency	*73%*	
Heat recovery efficiency	90%	OK
Manufacturer/Model	DV110 Adroit	
Commissioning		

9 Local generation
N/A

10 Heat networks
N/A

11 Supporting documentary evidence	
Documentary evidence identified in 11.1 and 11.2 is needed to confirm the data values used for any calculations undertaken, manufacturer declarations made, and tests performed as reflected in this "As built" BREL Compliance Report are correct. 11.1 SAP Conventions, Appendix 1 (documentary evidence) schedules the minimum documentary evidence required. 11.2 Indicative photographic evidence of key stages during construction (guidance within Approved Document L, Volume 1 – Appendix B) that confirms the products identified in this BREL Compliance Report are used in this dwelling, and workmanship is of sufficient quality to support the calculated values claimed in 2a to 2d.	

12 Declarations	
a. Assessor Declaration	
This declaration by the assessor is confirmation that the contents of this BREL Compliance Report are a true and accurate reflection based upon the design and construction information submitted for this dwelling for the purpose of carrying out the assessment, and that the supporting documentary evidence (identified in 11.1 and 11.2) pursuant to Part L of the Building Regulations 2010 (as amended) has been reviewed in the course of preparing this BREL Compliance Report.	
Signed: Name:	Assessor ID: Date:
b. Client Declaration	
This declaration by the client is confirmation that the dwelling has been constructed and completed according to the specifications set out in this BREL Compliance Report, and that photographic evidence of key stages, as described in 11.2, has been provided to the Assessor for this dwelling.	
Signed: Name:	Organisation: Date:

Full SAP Calculation Printout

Property Reference	78449-03	**Issued on Date**	03/10/2025
Assessment Reference	001	**Prop Type Ref**	Mid
Property	850 Rochdale Road, MANCHESTER, M9 8FA		

SAP Rating	84 B	**DER**	3.63	**TER**	11.59
Environmental	97 A	**% DER < TER**			68.68
CO_2 Emissions (t/year)	0.32	**DFEE**	34.22	**TFEE**	37.64
Compliance Check	See BREL	**% DFEE < TFEE**			9.08
% DPER < TPER	36.77	**DPER**	38.42	**TPER**	60.76

Assessor Details	Mr. Daniel Goddard	**Assessor ID**	CP52-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	41.1800 (1b)	x	2.4800 (2b)	=	102.1264	(1b) - (3b)
First floor	49.7800 (1c)	x	2.7800 (2c)	=	138.3884	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	90.9600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	240.5148	(5)

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2. Ventilation rate

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				m3 per hour	
Number of open chimneys			0 * 80 =	0.0000	(6a)
Number of open flues			0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire			0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler			0 * 20 =	0.0000	(6d)
Number of flues attached to other heater			0 * 35 =	0.0000	(6e)
Number of blocked chimneys			0 * 20 =	0.0000	(6f)
Number of intermittent extract fans			0 * 10 =	0.0000	(7a)
Number of passive vents			0 * 10 =	0.0000	(7b)
Number of flueless gas fires			0 * 40 =	0.0000	(7c)
				Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =			0.0000 / (5) =	0.0000	(8)
Pressure test				Yes	
Pressure Test Method				Blower Door	
Measured/design AP50				5.0000	(17)
Infiltration rate				0.2500	(18)
Number of sides sheltered				2	(19)
Shelter factor			(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =	0.2125	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2709	0.2656	0.2603	0.2338	0.2284	0.2019	0.2019	0.1966	0.2125	0.2284	0.2391	0.2497	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	81.0000	(23c)

Effective ac	0.3659	0.3606	0.3553	0.3287	0.3234	0.2969	0.2969	0.2916	0.3075	0.3234	0.3341	0.3447	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door			4.1400	1.0000	4.1400			(26)
Window			8.5100	0.7752	6.5969			(27)
GF			41.1800	0.0900	3.7062	75.0000	3088.5000	(28a)
Exposed Floor			8.6000	0.1400	1.2040	20.0000	172.0000	(28b)
Main	71.8472	12.6500	59.1972	0.1300	7.6956	9.0000	532.7748	(29a)
PIJ	49.7800		49.7800	0.1300	6.4714	9.0000	448.0200	(30)
Total net area of external elements Aum(A, m2)			171.4072					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.8141			(33)
Main dwelling								
Party Wall 1			81.2200	0.0000	0.0000	20.0000	1624.4000	(32)
Timber			96.4800			9.0000	868.3200	(32c)
FF			41.1800			18.0000	741.2400	(32d)
GF			41.1800			9.0000	370.6200	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 7845.8748 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 86.2563 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	8.6300	0.1150	0.9925
E3 Sill	8.6300	0.0170	0.1467
E4 Jamb	28.2000	0.0940	2.6508
E5 Ground floor (normal)	16.6400	0.0670	1.1149
E16 Corner (normal)	4.9600	0.0680	0.3373
E12 Gable (insulation at ceiling level)	11.0000	0.0770	0.8470
E6 Intermediate floor within a dwelling	11.0000	0.0320	0.3520
E17 Corner (inverted - internal area greater than external area)	4.9600	-0.0290	-0.1438
P1 Party wall - Ground floor	12.4600	0.3200	3.9872
E20 Exposed floor (normal)	6.4400	0.0790	0.5088
E21 Exposed floor (inverted)	12.0800	0.0630	0.7610
E18 Party wall between dwellings	11.1200	0.0920	1.0230
P4 Party wall - Roof (insulation at ceiling level)	18.1000	0.1020	1.8462
E25 Staggered party wall between dwellings	9.9200	0.0560	0.5555

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 14.9790 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 44.7932 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	29.0444	28.6228	28.2011	26.0928	25.6712	23.5629	23.5629	23.1413	24.4062	25.6712	26.5145	27.3578	(38)

Heat transfer coeff

	73.8376	73.4159	72.9943	70.8860	70.4644	68.3561	68.3561	67.9345	69.1994	70.4644	71.3077	72.1510	(39)

Average = Sum(39)m / 12 = 70.7806

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8118	0.8071	0.8025	0.7793	0.7747	0.7515	0.7515	0.7469	0.7608	0.7747	0.7839	0.7932	(40)
HLP (average)												0.7782	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6386 (42)
Hot water usage for mixer showers

68.4610	67.4321	65.9329	63.0644	60.9476	58.5869	57.2450	58.7329	60.3639	62.8986	65.8287	68.1987	(42a)

Hot water usage for baths

29.5637	29.1246	28.5063	27.3663	26.5127	25.5661	25.0549	25.6688	26.3373	27.3502	28.5137	29.4637	(42b)

Hot water usage for other uses

41.6522	40.1376	38.6230	37.1084	35.5937	34.0791	34.0791	35.5937	37.1084	38.6230	40.1376	41.6522	(42c)

Average daily hot water use (litres/day) 128.3946 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	139.6769	136.6944	133.0622	127.5391	123.0540	118.2321	116.3790	119.9955	123.8096	128.8717	134.4799	139.3147	(44)
Energy conte	221.2141	194.6510	204.5117	174.5947	165.6543	145.3802	140.7503	148.5795	152.6696	174.8777	191.5913	218.1331	(45)

Energy content (annual) Total = Sum(45)m = 2132.6075
Distribution loss (46)m = 0.15 x (45)m

33.1821	29.1976	30.6768	26.1892	24.8482	21.8070	21.1126	22.2869	22.9004	26.2317	28.7387	32.7200	(46)

Water storage loss:
Store volume 210.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.5800 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.8532 (55)
Total storage loss

26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(56)

If cylinder contains dedicated solar storage

26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

270.9257	239.5518	254.2233	222.7027	215.3659	193.4882	190.4619	198.2911	200.7776	224.5893	239.6993	267.8447	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

270.9257	239.5518	254.2233	222.7027	215.3659	193.4882	190.4619	198.2911	200.7776	224.5893	239.6993	267.8447	(64)

Total per year (kWh/year) = Sum(64)m = 2717.9215 (64)
12Total per year (kWh/year) 2718 (64)
Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)
Heat gains from water heating, kWh/month

113.3230	100.6421	107.7694	96.5391	94.8493	86.8253	86.5688	89.1720	89.2490	97.9161	102.1905	112.2985	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

145.9975	161.6401	145.9975	150.8641	145.9975	150.8641	145.9975	145.9975	150.8641	145.9975	150.8641	145.9975	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

240.8328	243.3319	237.0343	223.6274	206.7036	190.7976	180.1714	177.6723	183.9699	197.3768	214.3007	230.2066	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	(71)

Water heating gains (Table 5)

152.3158	149.7650	144.8514	134.0821	127.4857	120.5907	116.3559	119.8548	123.9570	131.6077	141.9313	150.9389	(72)

Total internal gains

601.7256	617.3165	590.4626	571.1531	542.7662	524.8319	505.1042	506.1041	521.3705	537.5615	569.6755	589.7225	(73)

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6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains

		m2	Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	factor Table 6d	W	
East		4.9800	19.6403	0.3000	0.0000	0.7700	22.5938	(76)
West		3.5300	19.6403	0.3000	0.0000	0.7700	16.0153	(80)

Solar gains	38.6090	75.5274	124.3829	181.4051	222.3188	227.5828	216.6681	186.1147	144.6625	89.6197	48.1409	31.7502	(83)
Total gains	640.3346	692.8439	714.8456	752.5582	765.0850	752.4147	721.7724	692.2188	666.0330	627.1812	617.8164	621.4727	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	29.5163	29.6858	29.8573	30.7453	30.9292	31.8832	31.8832	32.0811	31.4946	30.9292	30.5635	30.2062	
alpha	2.9678	2.9791	2.9905	3.0497	3.0619	3.1255	3.1255	3.1387	3.0996	3.0619	3.0376	3.0137	
util living area	0.9257	0.9043	0.8731	0.7999	0.6927	0.5314	0.4005	0.4303	0.6197	0.8090	0.8948	0.9301	(86)
Living	19.2059	19.4405	19.7783	20.2732	20.6431	20.8917	20.9664	20.9577	20.8146	20.3581	19.7568	19.2090	
Non living	18.5914	18.8234	19.1557	19.6451	19.9905	20.2218	20.2776	20.2761	20.1543	19.7347	19.1505	18.6062	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.0822	19.4405	19.7783	20.2732	20.6431	20.8917	20.9664	20.9577	20.8146	20.3581	19.7568	19.4595	(87)
Th 2	20.2432	20.2472	20.2512	20.2713	20.2753	20.2956	20.2956	20.2996	20.2875	20.2753	20.2673	20.2592	(88)
util rest of house	0.9178	0.8943	0.8594	0.7783	0.6591	0.4833	0.3413	0.3709	0.5731	0.7843	0.8824	0.9227	(89)
MIT 2	19.3982	18.8234	19.1557	19.6451	19.9905	20.2218	20.2776	20.2761	20.1543	19.7347	19.1505	18.8374	(90)
Living area fraction									fLA = Living area / (4) =			0.3196	(91)
MIT	19.6168	19.0206	19.3547	19.8458	20.1991	20.4359	20.4977	20.4939	20.3653	19.9339	19.3443	19.0362	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6168	19.0206	19.3547	19.8458	20.1991	20.4359	20.4977	20.4939	20.3653	19.9339	19.3443	19.0362	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9104	0.8750	0.8406	0.7644	0.6553	0.4932	0.3586	0.3877	0.5784	0.7714	0.8641	0.9082	(94)
Useful gains	582.9793	606.2386	600.8828	575.2925	501.3654	371.0947	258.8479	268.3853	385.2521	483.8220	533.8636	564.4085	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1130.9558	1036.6772	938.3184	775.9072	598.8824	398.9171	266.4323	278.1170	433.5571	657.7081	873.1091	1070.4479	(97)
Space heating kWh	407.6946	289.2547	251.0521	144.4425	72.5527	0.0000	0.0000	0.0000	0.0000	129.3713	244.2568	376.4933	(98a)
Space heating requirement - total per year (kWh/year)												1915.1180	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	407.6946	289.2547	251.0521	144.4425	72.5527	0.0000	0.0000	0.0000	0.0000	129.3713	244.2568	376.4933	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1915.1180	
Space heating per m2											(98c) / (4) =	21.0545	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Efficiency of main space heating system 1 (in %)	270.8847 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	407.6946	289.2547	251.0521	144.4425	72.5527	0.0000	0.0000	0.0000	0.0000	129.3713	244.2568	376.4933	(98)
Space heating efficiency (main heating system 1)	270.8847	270.8847	270.8847	270.8847	0.0000	0.0000	0.0000	0.0000	270.8847	270.8847	270.8847	270.8847	(210)
Space heating fuel (main heating system)	150.5048	106.7815	92.6786	53.3225	26.7836	0.0000	0.0000	0.0000	0.0000	47.7588	90.1700	138.9866	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	270.9257	239.5518	254.2233	222.7027	215.3659	193.4882	190.4619	198.2911	200.7776	224.5893	239.6993	267.8447	(64)
Efficiency of water heater												281.0493	(216)
(217)m	281.0493	281.0493	281.0493	281.0493	281.0493	281.0493	281.0493	281.0493	281.0493	281.0493	281.0493	281.0493	(217)
Fuel for water heating, kWh/month	96.3979	85.2348	90.4551	79.2397	76.6292	68.8449	67.7682	70.5539	71.4386	79.9110	85.2873	95.3017	(219)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	29.6563	26.7864	29.6563	28.6997	29.6563	28.6997	29.6563	29.6563	28.6997	29.6563	28.6997	29.6563	(231)
Lighting	30.8703	24.7653	22.2984	16.3368	12.6190	10.3098	11.5115	14.9631	19.4355	25.5005	28.8027	31.7283	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	706.9864	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	281.0493	
Water heating fuel used	967.0623	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.1900)		
mechanical ventilation fans (SFP = 1.1900)	349.1794	(230a)
Total electricity for the above, kWh/year	349.1794	(231)
Electricity for lighting (calculated in Appendix L)	249.1413	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2272.3695	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	706.9864	0.1552	109.7234	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	967.0623	0.1410	136.3181	(264)
Space and water heating			246.0414	(265)
Pumps, fans and electric keep-hot	349.1794	0.1387	48.4355	(267)
Energy for lighting	249.1413	0.1443	35.9588	(268)
Total CO2, kg/year			330.4357	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.6300	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	706.9864	1.5746	1113.1910	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	967.0623	1.5212	1471.1200	(278)
Space and water heating			2584.3110	(279)
Pumps, fans and electric keep-hot	349.1794	1.5128	528.2386	(281)
Energy for lighting	249.1413	1.5338	382.1413	(282)
Total Primary energy kWh/year			3494.6909	(286)
Dwelling Primary energy Rate (DPER)			38.4200	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	41.1800	(1b)	x 2.4800	(2b) =	102.1264	(1b) - (3b)
First floor	49.7800	(1c)	x 2.7800	(2c) =	138.3884	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	90.9600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		240.5148	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1247	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3747	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3185	(21)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4061	0.3982	0.3902	0.3504	0.3424	0.3026	0.3026	0.2946	0.3185	0.3424	0.3583	0.3743 (22b)
Effective ac	0.5825	0.5793	0.5761	0.5614	0.5586	0.5458	0.5458	0.5434	0.5507	0.5586	0.5642	0.5700 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			4.1400	1.0000	4.1400			(26)
TER Opening Type			8.5100	1.1450	9.7443			(27)
GF			41.1800	0.1300	5.3534			(28a)
Exposed Floor			8.6000	0.1300	1.1180			(28b)
Main	71.8472	12.6500	59.1972	0.1800	10.6555			(29a)
PIJ	49.7800		49.7800	0.1100	5.4758			(30)
Total net area of external elements Aum(A, m2)			171.4072					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	36.4870			(33)
Main dwelling								
Party Wall 1			81.2200	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 86.2563 (35)

List of Thermal Bridges

	Length	Psi-value	Total	
K1 Element				
E2 Other lintels (including other steel lintels)	8.6300	0.0500	0.4315	
E3 Sill	8.6300	0.0500	0.4315	
E4 Jamb	28.2000	0.0500	1.4100	
E5 Ground floor (normal)	16.6400	0.1600	2.6624	
E16 Corner (normal)	4.9600	0.0900	0.4464	
E12 Gable (insulation at ceiling level)	11.0000	0.0600	0.6600	
E6 Intermediate floor within a dwelling	11.0000	0.0000	0.0000	
E17 Corner (inverted - internal area greater than external area)	4.9600	-0.0900	-0.4464	
P1 Party wall - Ground floor	12.4600	0.0800	0.9968	
E20 Exposed floor (normal)	6.4400	0.3200	2.0608	
E21 Exposed floor (inverted)	12.0800	0.3200	3.8656	
E18 Party wall between dwellings	11.1200	0.0600	0.6672	
P4 Party wall - Roof (insulation at ceiling level)	18.1000	0.1200	2.1720	
E25 Staggered party wall between dwellings	9.9200	0.0600	0.5952	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 15.9530 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 52.4400 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	46.2302	45.9760	45.7269	44.5568	44.3378	43.3187	43.3187	43.1299	43.7112	44.3378	44.7807	45.2438	(38)
Heat transfer coeff	98.6702	98.4160	98.1669	96.9967	96.7778	95.7586	95.7586	95.5699	96.1512	96.7778	97.2207	97.6837	(39)
Average = Sum(39)m / 12 =												96.9957	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0848	1.0820	1.0792	1.0664	1.0640	1.0528	1.0528	1.0507	1.0571	1.0640	1.0688	1.0739	(40)
HLP (average)												1.0664	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6386 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	68.4610	67.4321	65.9329	63.0644	60.9476	58.5869	57.2450	58.7329	60.3639	62.8986	65.8287	68.1987	(42a)
Hot water usage for baths	29.5637	29.1246	28.5063	27.3663	26.5127	25.5661	25.0549	25.6688	26.3373	27.3502	28.5137	29.4637	(42b)
Hot water usage for other uses	41.6522	40.1376	38.6230	37.1084	35.5937	34.0791	34.0791	35.5937	37.1084	38.6230	40.1376	41.6522	(42c)
Average daily hot water use (litres/day)												128.3946	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	139.6769	136.6944	133.0622	127.5391	123.0540	118.2321	116.3790	119.9955	123.8096	128.8717	134.4799	139.3147	(44)
Energy conte	221.2141	194.6510	204.5117	174.5947	165.6543	145.3802	140.7503	148.5795	152.6696	174.8777	191.5913	218.1331	(45)
Energy content (annual)										Total = Sum(45)m =		2132.6075	
Distribution loss (46)m = 0.15 x (45)m	33.1821	29.1976	30.6768	26.1892	24.8482	21.8070	21.1126	22.2869	22.9004	26.2317	28.7387	32.7200	(46)
Water storage loss:													
Store volume												210.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7016	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.9188	(55)
Total storage loss	28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842	(56)
If cylinder contains dedicated solar storage	28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	272.9607	241.3898	256.2583	224.6720	217.4009	195.4575	192.4969	200.3261	202.7469	226.6243	241.6687	269.8797	(62)
WWHRS	-31.2975	-27.6798	-28.9847	-24.0004	-22.3675	-19.1401	-17.9408	-19.0782	-19.8031	-23.3456	-26.4477	-30.7179	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	241.6632	213.7101	227.2737	200.6716	195.0334	176.3175	174.5562	181.2479	182.9439	203.2787	215.2209	239.1618	(64)
										Total per year (kWh/year) = Sum(64)m =		2451.0786	(64)
12Total per year (kWh/year)												2451	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	114.9510	102.1125	109.3974	98.1146	96.4773	88.4008	88.1968	90.7999	90.8245	99.5441	103.7660	113.9265	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	142.2156	157.4530	142.2156	146.9561	142.2156	146.9561	142.2156	142.2156	146.9561	142.2156	146.9561	142.2156	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	240.8328	243.3319	237.0343	223.6274	206.7036	190.7976	180.1714	177.6723	183.9699	197.3768	214.3007	230.2066	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	(71)

Water heating gains (Table 5)

	154.5040	151.9532	147.0395	136.2703	129.6738	122.7789	118.5440	122.0429	126.1452	133.7959	144.1194	153.1270	(72)

Total internal gains

	603.1319	618.3176	591.8689	572.4333	544.1725	523.1121	503.5105	504.5103	519.6507	538.9678	570.9557	591.1288	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	4.9800	19.6403	0.6300	0.7000	0.7700	29.8916	(76)
West	3.5300	19.6403	0.6300	0.7000	0.7700	21.1882	(80)

Solar gains	51.0797	99.9228	164.5586	239.9990	294.1277	301.0921	286.6519	246.2298	191.3885	118.5668	63.6904	42.0055	(83)
Total gains	654.2116	718.2404	756.4276	812.4323	838.3003	824.2042	790.1625	750.7401	711.0392	657.5346	634.6461	633.1343	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	22.0878	22.1449	22.2011	22.4689	22.5197	22.7594	22.7594	22.8043	22.6665	22.5197	22.4171	22.3109	
alpha	2.4725	2.4763	2.4801	2.4979	2.5013	2.5173	2.5173	2.5203	2.5111	2.5013	2.4945	2.4874	
util living area	0.9360	0.9177	0.8901	0.8304	0.7393	0.6039	0.4758	0.5113	0.6900	0.8457	0.9133	0.9404	(86)
MIT	18.4055	18.6788	19.1165	19.7406	20.2920	20.7078	20.8849	20.8584	20.5623	19.8623	19.0543	18.3688	(87)
Th 2	20.0133	20.0156	20.0178	20.0284	20.0304	20.0396	20.0396	20.0413	20.0360	20.0304	20.0264	20.0222	(88)
util rest of house	0.9279	0.9074	0.8758	0.8069	0.7003	0.5405	0.3887	0.4252	0.6331	0.8197	0.9008	0.9329	(89)
MIT 2	16.9801	17.3251	17.8765	18.6558	19.3201	19.7941	19.9672	19.9474	19.6441	18.8191	17.8103	16.9389	(90)
Living area fraction									fLA = Living area / (4) =			0.3196	(91)
MIT	17.4357	17.7577	18.2728	19.0025	19.6307	20.0861	20.2605	20.2386	19.9375	19.1525	18.2078	17.3959	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.4357	17.7577	18.2728	19.0025	19.6307	20.0861	20.2605	20.2386	19.9375	19.1525	18.2078	17.3959	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8993	0.8764	0.8434	0.7775	0.6822	0.5438	0.4098	0.4440	0.6266	0.7911	0.8703	0.9053	(94)
Useful gains	588.3189	629.4443	637.9923	631.6314	571.9223	448.2148	323.7839	333.2941	445.5711	520.1449	552.3117	573.1478	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1296.0984	1265.4063	1155.6998	979.9051	767.5179	525.3461	350.5219	366.8520	561.2863	827.6930	1079.9121	1289.0229	(97)
Space heating kWh	526.5880	427.3664	385.1743	250.7571	145.5232	0.0000	0.0000	0.0000	0.0000	228.8158	379.8723	532.6111	(98a)
Space heating requirement - total per year (kWh/year)												2876.7082	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	526.5880	427.3664	385.1743	250.7571	145.5232	0.0000	0.0000	0.0000	228.8158	379.8723	532.6111	(98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												2876.7082	
Space heating per m2											(98c) / (4) =	31.6261	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	526.5880	427.3664	385.1743	250.7571	145.5232	0.0000	0.0000	0.0000	0.0000	228.8158	379.8723	532.6111	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	570.5179	463.0189	417.3070	271.6761	157.6632	0.0000	0.0000	0.0000	0.0000	247.9044	411.5627	577.0434	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	241.6632	213.7101	227.2737	200.6716	195.0334	176.3175	174.5562	181.2479	182.9439	203.2787	215.2209	239.1618	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.7576	85.5823	85.2328	84.5606	83.4125	79.8000	79.8000	79.8000	79.8000	84.3258	85.3199	85.8013	(217)
Fuel for water heating, kWh/month	281.7980	249.7128	266.6504	237.3110	233.8180	220.9492	218.7421	227.1276	229.2530	241.0634	252.2517	278.7391	(219)

Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	29.5496	23.7058	21.3444	15.6378	12.0791	9.8687	11.0190	14.3229	18.6040	24.4095	27.5704	30.3709	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-38.9812	-55.1702	-79.5760	-89.7571	-96.9883	-90.5718	-89.4598	-84.3870	-75.4216	-63.2498	-42.9366	-33.6769	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-21.3144	-44.9402	-89.5251	-134.7575	-178.4789	-179.4591	-177.3409	-150.0006	-109.7478	-64.3537	-28.4842	-16.8460	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	3116.6936	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2937.4164	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	238.4821	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-2035.4247	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	4343.1674	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3116.6936	0.2100	654.5057	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2937.4164	0.2100	616.8574	(264)
Space and water heating			1271.3631	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	238.4821	0.1443	34.4203	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-840.1762	0.1345	-113.0202	
PV Unit electricity exported	-1195.2485	0.1258	-150.3985	
Total			-263.4187	(269)
Total CO2, kg/year			1054.2940	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.5900	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	3116.6936	1.1300	3521.8638	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2937.4164	1.1300	3319.2805	(278)
Space and water heating			6841.1443	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	238.4821	1.5338	365.7919	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-840.1762	1.4972	-1257.8767	
PV Unit electricity exported	-1195.2485	0.4619	-552.0620	
Total			-1809.9387	(283)
Total Primary energy kWh/year			5527.0983	(286)
Target Primary Energy Rate (TPER)			60.7600	(287)

Full SAP Calculation Printout

Property Reference	78449-03	**Issued on Date**	03/10/2025
Assessment Reference	001	**Prop Type Ref**	Mid
Property	850 Rochdale Road, MANCHESTER, M9 8FA		

SAP Rating	84 B	**DER**	3.63	**TER**	11.59
Environmental	97 A	**% DER < TER**			68.68
CO_2 Emissions (t/year)	0.32	**DFEE**	34.22	**TFEE**	37.64
Compliance Check	See BREL	**% DFEE < TFEE**			9.08
% DPER < TPER	36.77	**DPER**	38.42	**TPER**	60.76

Assessor Details	Mr. Daniel Goddard	**Assessor ID**	CP52-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	41.1800 (1b)	x	2.4800 (2b)	=	102.1264	(1b) - (3b)
First floor	49.7800 (1c)	x	2.7800 (2c)	=	138.3884	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	90.9600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	240.5148	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1247	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3747	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3185	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4061	0.3982	0.3902	0.3504	0.3424	0.3026	0.3026	0.2946	0.3185	0.3424	0.3583	0.3743	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0.0000	(23c)

Effective ac	0.5825	0.5793	0.5761	0.5614	0.5586	0.5458	0.5458	0.5434	0.5507	0.5586	0.5642	0.5700	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door			4.1400	1.0000	4.1400			(26)
Window			8.5100	0.7752	6.5969			(27)
GF			41.1800	0.0900	3.7062	75.0000	3088.5000	(28a)
Exposed Floor			8.6000	0.1400	1.2040	20.0000	172.0000	(28b)
Main	71.8472	12.6500	59.1972	0.1300	7.6956	9.0000	532.7748	(29a)
PIJ	49.7800		49.7800	0.1300	6.4714	9.0000	448.0200	(30)
Total net area of external elements Aum(A, m2)			171.4072					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	29.8141			(33)
Main dwelling								
Party Wall 1			81.2200	0.0000	0.0000	20.0000	1624.4000	(32)
Timber			96.4800			9.0000	868.3200	(32c)
FF			41.1800			18.0000	741.2400	(32d)
GF			41.1800			9.0000	370.6200	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	7845.8748 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		86.2563 (35)
List of Thermal Bridges		

	Length	Psi-value	Total	
K1 Element				
E2 Other lintels (including other steel lintels)	8.6300	0.1150	0.9925	
E3 Sill	8.6300	0.0170	0.1467	
E4 Jamb	28.2000	0.0940	2.6508	
E5 Ground floor (normal)	16.6400	0.0670	1.1149	
E16 Corner (normal)	4.9600	0.0680	0.3373	
E12 Gable (insulation at ceiling level)	11.0000	0.0770	0.8470	
E6 Intermediate floor within a dwelling	11.0000	0.0320	0.3520	
E17 Corner (inverted - internal area greater than external area)	4.9600	-0.0290	-0.1438	
P1 Party wall - Ground floor	12.4600	0.3200	3.9872	
E20 Exposed floor (normal)	6.4400	0.0790	0.5088	
E21 Exposed floor (inverted)	12.0800	0.0630	0.7610	
E18 Party wall between dwellings	11.1200	0.0920	1.0230	
P4 Party wall - Roof (insulation at ceiling level)	18.1000	0.1020	1.8462	
E25 Staggered party wall between dwellings	9.9200	0.0560	0.5555	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			14.9790	(36)
Point Thermal bridges		(36a) =	0.0000	
Total fabric heat loss		(33) + (36) + (36a) =	44.7932	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	46.2302	45.9760	45.7269	44.5568	44.3378	43.3187	43.3187	43.1299	43.7112	44.3378	44.7807	45.2438	(38)
Heat transfer coeff	91.0234	90.7692	90.5201	89.3499	89.1310	88.1119	88.1119	87.9231	88.5044	89.1310	89.5739	90.0369	(39)
Average = Sum(39)m / 12 =												89.3489	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0007	0.9979	0.9952	0.9823	0.9799	0.9687	0.9687	0.9666	0.9730	0.9799	0.9848	0.9899	(40)
HLP (average)												0.9823	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Assumed occupancy												2.6386	(42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	29.5637	29.1246	28.5063	27.3663	26.5127	25.5661	25.0549	25.6688	26.3373	27.3502	28.5137	29.4637	(42b)
Hot water usage for other uses	41.6522	40.1376	38.6230	37.1084	35.5937	34.0791	34.0791	35.5937	37.1084	38.6230	40.1376	41.6522	(42c)
Average daily hot water use (litres/day)												65.2759	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	71.2159	69.2622	67.1293	64.4747	62.1064	59.6452	59.1340	61.2626	63.4457	65.9732	68.6513	71.1160	(44)
Energy conte	112.7886	98.6285	103.1753	88.2626	83.6072	73.3408	71.5174	75.8559	78.2349	89.5249	97.8063	111.3504	(45)
Energy content (annual)										Total = Sum(45)m =		1084.0928	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	95.8703	83.8342	87.6990	75.0232	71.0661	62.3397	60.7898	64.4775	66.4996	76.0962	83.1354	94.6479	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	95.8703	83.8342	87.6990	75.0232	71.0661	62.3397	60.7898	64.4775	66.4996	76.0962	83.1354	94.6479	(64)
										Total per year (kWh/year) = Sum(64)m =		921.4789	(64)
12Total per year (kWh/year)												921	(64)
Electric shower(s)	54.8258	48.8503	53.3426	50.9042	51.8594	49.4688	51.1178	51.8594	50.9042	53.3426	52.3396	54.8258	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		623.6406	(64a)
Heat gains from water heating, kWh/month	37.6740	33.1711	35.2604	31.4819	30.7314	27.9521	27.9769	29.0842	29.3510	32.3597	33.8687	37.3684	(65)

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5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	145.9975	161.6401	145.9975	150.8641	145.9975	150.8641	145.9975	145.9975	150.8641	145.9975	150.8641	145.9975	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	240.8328	243.3319	237.0343	223.6274	206.7036	190.7976	180.1714	177.6723	183.9699	197.3768	214.3007	230.2066	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	(71)
Water heating gains (Table 5)	50.6372	49.3618	47.3930	43.7248	41.3056	38.8224	37.6034	39.0917	40.7652	43.4942	47.0399	50.2264	(72)
Total internal gains	500.0470	516.9133	493.0043	480.7957	456.5862	443.0635	426.3517	425.3410	438.1787	449.4480	474.7841	489.0100	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	4.9800	19.6403	0.3000	0.0000	0.7700	22.5938	(76)
West	3.5300	19.6403	0.3000	0.0000	0.7700	16.0153	(80)

Solar gains	38.6090	75.5274	124.3829	181.4051	222.3188	227.5828	216.6681	186.1147	144.6625	89.6197	48.1409	31.7502	(83)
Total gains	538.6560	592.4407	617.3872	662.2009	678.9049	670.6464	643.0199	611.4557	582.8412	539.0677	522.9250	520.7602	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	23.9434	24.0105	24.0765	24.3918	24.4518	24.7346	24.7346	24.7877	24.6249	24.4518	24.3309	24.2057	
alpha	2.5962	2.6007	2.6051	2.6261	2.6301	2.6490	2.6490	2.6525	2.6417	2.6301	2.6221	2.6137	
util living area	0.9553	0.9409	0.9205	0.8713	0.7924	0.6605	0.5285	0.5654	0.7421	0.8831	0.9377	0.9587	(86)
MIT	18.3957	18.6561	19.0682	19.6845	20.2400	20.6826	20.8745	20.8458	20.5334	19.8223	19.0327	18.3640	(87)
Th 2	20.0828	20.0851	20.0874	20.0981	20.1001	20.1095	20.1095	20.1112	20.1059	20.1001	20.0961	20.0918	(88)
util rest of house	0.9496	0.9334	0.9098	0.8526	0.7590	0.6012	0.4423	0.4813	0.6912	0.8625	0.9285	0.9535	(89)
MIT 2	17.6867	17.9450	18.3528	18.9606	19.4904	19.8937	20.0444	20.0272	19.7689	19.1029	18.3273	17.6614	(90)
Living area fraction										fLA = Living area / (4) =		0.3196	(91)
MIT	17.9133	18.1723	18.5814	19.1920	19.7300	20.1459	20.3097	20.2888	20.0132	19.3328	18.5527	17.8859	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.9133	18.1723	18.5814	19.1920	19.7300	20.1459	20.3097	20.2888	20.0132	19.3328	18.5527	17.8859	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9316	0.9130	0.8875	0.8302	0.7434	0.6038	0.4629	0.4993	0.6853	0.8411	0.9082	0.9364	(94)
Useful gains	501.7981	540.8973	547.9198	549.7682	504.6789	404.9694	297.6235	305.2822	399.4211	453.4351	474.9412	487.6325	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1239.1269	1204.7135	1093.6108	919.5872	715.7213	488.6558	326.8695	341.9194	523.3451	778.3676	1025.8637	1232.2388	(97)
Space heating kWh	548.5726	446.0845	405.9941	266.2697	157.0156	0.0000	0.0000	0.0000	0.0000	241.7498	396.6642	553.9871	(98a)
Space heating requirement - total per year (kWh/year)												3016.3375	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	548.5726	446.0845	405.9941	266.2697	157.0156	0.0000	0.0000	0.0000	0.0000	241.7498	396.6642	553.9871	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3016.3375	
Space heating per m2											(98c) / (4) =	33.1611	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	828.2514	652.0277	668.2157	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.6672	0.7409	0.7138	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	552.6268	483.0982	476.9890	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	708.6181	679.8104	645.9957	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	112.3137	146.3539	125.7410	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	28.0784	36.5885	31.4352	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												96.1022	(107)
Energy for space heating												33.1611	(99)
Energy for space cooling												1.0565	(108)
Total												34.2177	(109)
Fabric Energy Efficiency (DFEE)												34.2	(109)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	41.1800	(1b)	x 2.4800	(2b) =	102.1264	(1b) - (3b)
First floor	49.7800	(1c)	x 2.7800	(2c) =	138.3884	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	90.9600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		240.5148	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)

Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1247	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3747	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3185	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													
	0.4061	0.3982	0.3902	0.3504	0.3424	0.3026	0.3026	0.2946	0.3185	0.3424	0.3583	0.3743	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0.0000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5825	0.5793	0.5761	0.5614	0.5586	0.5458	0.5458	0.5434	0.5507	0.5586	0.5642	0.5700	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			4.1400	1.0000	4.1400			(26)
TER Opening Type			8.5100	1.1450	9.7443			(27)
GF			41.1800	0.1300	5.3534			(28a)
Exposed Floor			8.6000	0.1300	1.1180			(28b)
Main	71.8472	12.6500	59.1972	0.1800	10.6555			(29a)
PIJ	49.7800		49.7800	0.1100	5.4758			(30)
Total net area of external elements Aum(A, m2)			171.4072					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	36.4870			(33)
Main dwelling								
Party Wall 1			81.2200	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 86.2563 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	8.6300	0.0500	0.4315
E3 Sill	8.6300	0.0500	0.4315
E4 Jamb	28.2000	0.0500	1.4100
E5 Ground floor (normal)	16.6400	0.1600	2.6624
E16 Corner (normal)	4.9600	0.0900	0.4464
E12 Gable (insulation at ceiling level)	11.0000	0.0600	0.6600
E6 Intermediate floor within a dwelling	11.0000	0.0000	0.0000
E17 Corner (inverted - internal area greater than external area)	4.9600	-0.0900	-0.4464
P1 Party wall - Ground floor	12.4600	0.0800	0.9968
E20 Exposed floor (normal)	6.4400	0.3200	2.0608
E21 Exposed floor (inverted)	12.0800	0.3200	3.8656
E18 Party wall between dwellings	11.1200	0.0600	0.6672
P4 Party wall - Roof (insulation at ceiling level)	18.1000	0.1200	2.1720
E25 Staggered party wall between dwellings	9.9200	0.0600	0.5952

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		15.9530 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	52.4400 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	46.2302	45.9760	45.7269	44.5568	44.3378	43.3187	43.3187	43.1299	43.7112	44.3378	44.7807	45.2438	(38)
Heat transfer coeff													
	98.6702	98.4160	98.1669	96.9967	96.7778	95.7586	95.7586	95.5699	96.1512	96.7778	97.2207	97.6837	(39)
Average = Sum(39)m / 12 =												96.9957	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0848	1.0820	1.0792	1.0664	1.0640	1.0528	1.0528	1.0507	1.0571	1.0640	1.0688	1.0739	(40)
HLP (average)												1.0664	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.6386 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

29.5637	29.1246	28.5063	27.3663	26.5127	25.5661	25.0549	25.6688	26.3373	27.3502	28.5137	29.4637	(42b)

Hot water usage for other uses

41.6522	40.1376	38.6230	37.1084	35.5937	34.0791	34.0791	35.5937	37.1084	38.6230	40.1376	41.6522	(42c)

Average daily hot water use (litres/day)	65.2759 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	71.2159	69.2622	67.1293	64.4747	62.1064	59.6452	59.1340	61.2626	63.4457	65.9732	68.6513	71.1160	(44)
Energy conte	112.7886	98.6285	103.1753	88.2626	83.6072	73.3408	71.5174	75.8559	78.2349	89.5249	97.8063	111.3504	(45)
Energy content (annual)										Total = Sum(45)m =		1084.0928	
Distribution loss (46)m = 0.15 x (45)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	95.8703	83.8342	87.6990	75.0232	71.0661	62.3397	60.7898	64.4775	66.4996	76.0962	83.1354	94.6479	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)

FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	95.8703	83.8342	87.6990	75.0232	71.0661	62.3397	60.7898	64.4775	66.4996	76.0962	83.1354	94.6479	(64)
										Total per year (kWh/year) = Sum(64)m =		921.4789	(64)
12Total per year (kWh/year)												921	(64)
Electric shower(s)	54.8258	48.8503	53.3426	50.9042	51.8594	49.4688	51.1178	51.8594	50.9042	53.3426	52.3396	54.8258	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		623.6406	(64a)
Heat gains from water heating, kWh/month	37.6740	33.1711	35.2604	31.4819	30.7314	27.9521	27.9769	29.0842	29.3510	32.3597	33.8687	37.3684	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	142.2156	157.4530	142.2156	146.9561	142.2156	146.9561	142.2156	142.2156	146.9561	142.2156	146.9561	142.2156	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	240.8328	243.3319	237.0343	223.6274	206.7036	190.7976	180.1714	177.6723	183.9699	197.3768	214.3007	230.2066	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	(71)
Water heating gains (Table 5)	50.6372	49.3618	47.3930	43.7248	41.3056	38.8224	37.6034	39.0917	40.7652	43.4942	47.0399	50.2264	(72)
Total internal gains	496.2651	512.7262	489.2224	476.8878	452.8043	439.1556	422.5699	421.5591	434.2708	445.6662	470.8762	485.2281	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	4.9800	19.6403	0.6300	0.7000	0.7700	29.8916	(76)
West	3.5300	19.6403	0.6300	0.7000	0.7700	21.1882	(80)

Solar gains	51.0797	99.9228	164.5586	239.9990	294.1277	301.0921	286.6519	246.2298	191.3885	118.5668	63.6904	42.0055	(83)
Total gains	547.3448	612.6490	653.7810	716.8868	746.9320	740.2477	709.2218	667.7889	625.6593	564.2330	534.5666	527.2336	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	22.0878	22.1449	22.2011	22.4689	22.5197	22.7594	22.7594	22.8043	22.6665	22.5197	22.4171	22.3109	
alpha	2.4725	2.4763	2.4801	2.4979	2.5013	2.5173	2.5173	2.5203	2.5111	2.5013	2.4945	2.4874	
util living area	0.9553	0.9395	0.9159	0.8618	0.7774	0.6454	0.5167	0.5565	0.7358	0.8810	0.9378	0.9589	(86)
MIT	18.1813	18.4692	18.9293	19.5971	20.1934	20.6573	20.8607	20.8274	20.4857	19.7132	18.8568	18.1428	(87)
Th 2	20.0133	20.0156	20.0178	20.0284	20.0304	20.0396	20.0396	20.0413	20.0360	20.0304	20.0264	20.0222	(88)
util rest of house	0.9493	0.9315	0.9042	0.8412	0.7411	0.5823	0.4257	0.4674	0.6816	0.8592	0.9282	0.9535	(89)
MIT 2	17.4304	17.7155	18.1700	18.8263	19.3922	19.8117	19.9700	19.9503	19.6706	18.9496	18.1090	17.3981	(90)
Living area fraction										fLA = Living area / (4) =		0.3196	(91)
MIT	17.6704	17.9564	18.4127	19.0726	19.6482	20.0820	20.2547	20.2306	19.9311	19.1936	18.3480	17.6361	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.6704	17.9564	18.4127	19.0726	19.6482	20.0820	20.2547	20.2306	19.9311	19.1936	18.3480	17.6361	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9303	0.9095	0.8799	0.8170	0.7248	0.5854	0.4474	0.4863	0.6750	0.8360	0.9066	0.9354	(94)
Useful gains	509.1687	557.2223	575.2474	585.7154	541.3866	433.3140	317.2871	324.7498	422.3123	471.6937	484.6376	493.1838	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1319.2565	1284.9585	1169.4306	986.7115	769.2141	524.9448	349.9653	366.0891	560.6671	831.6736	1093.5350	1312.4905	(97)
Space heating kWh	602.7053	489.0387	442.0723	288.7172	169.5036	0.0000	0.0000	0.0000	0.0000	267.8250	438.4062	609.5642	(98a)
Space heating requirement - total per year (kWh/year)												3307.8326	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	602.7053	489.0387	442.0723	288.7172	169.5036	0.0000	0.0000	0.0000	0.0000	267.8250	438.4062	609.5642	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3307.8326	
Space heating per m2											(98c) / (4) =	36.3658	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	900.1313	708.6140	726.3314	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.6696	0.7408	0.7107	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	602.7506	524.9696	516.1911	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	794.2071	761.2522	715.7953	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	137.8487	175.7942	148.5055	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)

Intermittency factor (Table 10b)

0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)

Space cooling kWh

0.0000	0.0000	0.0000	0.0000	0.0000	34.4622	43.9486	37.1264	0.0000	0.0000	0.0000	0.0000	(107)

Space cooling requirement	115.5371	(107)
Energy for space heating	36.3658	(99)
Energy for space cooling	1.2702	(108)
Total	37.6360	(109)
Fabric Energy Efficiency (TFEE)	37.6	(109)

Full SAP Calculation Printout

Property Reference	78449-03	**Issued on Date**	03/10/2025
Assessment Reference	001	**Prop Type Ref**	Mid
Property	850 Rochdale Road, MANCHESTER, M9 8FA		

SAP Rating	84 B	**DER**	3.63	**TER**	11.59
Environmental	97 A	**% DER < TER**			68.68
CO_2 Emissions (t/year)	0.32	**DFEE**	34.22	**TFEE**	37.64
Compliance Check	See BREL	**% DFEE < TFEE**			9.08
% DPER < TPER	36.77	**DPER**	38.42	**TPER**	60.76

Assessor Details	Mr. Daniel Goddard	**Assessor ID**	CP52-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	41.1800 (1b)	x	2.4800 (2b)	=	102.1264	(1b) - (3b)
First floor	49.7800 (1c)	x	2.7800 (2c)	=	138.3884	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	90.9600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	240.5148	(5)

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2. Ventilation rate

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				m3 per hour	
Number of open chimneys			0 * 80 =	0.0000	(6a)
Number of open flues			0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire			0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler			0 * 20 =	0.0000	(6d)
Number of flues attached to other heater			0 * 35 =	0.0000	(6e)
Number of blocked chimneys			0 * 20 =	0.0000	(6f)
Number of intermittent extract fans			0 * 10 =	0.0000	(7a)
Number of passive vents			0 * 10 =	0.0000	(7b)
Number of flueless gas fires			0 * 40 =	0.0000	(7c)
				Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =			0.0000 / (5) =	0.0000	(8)
Pressure test				Yes	
Pressure Test Method				Blower Door	
Measured/design AP50				5.0000	(17)
Infiltration rate				0.2500	(18)
Number of sides sheltered				2	(19)
Shelter factor			(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =	0.2125	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2709	0.2656	0.2603	0.2338	0.2284	0.2019	0.2019	0.1966	0.2125	0.2284	0.2391	0.2497	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	81.0000	(23c)

Effective ac	0.3659	0.3606	0.3553	0.3287	0.3234	0.2969	0.2969	0.2916	0.3075	0.3234	0.3341	0.3447	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door			4.1400	1.0000	4.1400			(26)
Window			8.5100	0.7752	6.5969			(27)
GF			41.1800	0.0900	3.7062	75.0000	3088.5000	(28a)
Exposed Floor			8.6000	0.1400	1.2040	20.0000	172.0000	(28b)
Main	71.8472	12.6500	59.1972	0.1300	7.6956	9.0000	532.7748	(29a)
PIJ	49.7800		49.7800	0.1300	6.4714	9.0000	448.0200	(30)
Total net area of external elements Aum(A, m2)			171.4072					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.8141			(33)
Main dwelling								
Party Wall 1			81.2200	0.0000	0.0000	20.0000	1624.4000	(32)
Timber			96.4800			9.0000	868.3200	(32c)
FF			41.1800			18.0000	741.2400	(32d)
GF			41.1800			9.0000	370.6200	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 7845.8748 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 86.2563 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	8.6300	0.1150	0.9925
E3 Sill	8.6300	0.0170	0.1467
E4 Jamb	28.2000	0.0940	2.6508
E5 Ground floor (normal)	16.6400	0.0670	1.1149
E16 Corner (normal)	4.9600	0.0680	0.3373
E12 Gable (insulation at ceiling level)	11.0000	0.0770	0.8470
E6 Intermediate floor within a dwelling	11.0000	0.0320	0.3520
E17 Corner (inverted - internal area greater than external area)	4.9600	-0.0290	-0.1438
P1 Party wall - Ground floor	12.4600	0.3200	3.9872
E20 Exposed floor (normal)	6.4400	0.0790	0.5088
E21 Exposed floor (inverted)	12.0800	0.0630	0.7610
E18 Party wall between dwellings	11.1200	0.0920	1.0230
P4 Party wall - Roof (insulation at ceiling level)	18.1000	0.1020	1.8462
E25 Staggered party wall between dwellings	9.9200	0.0560	0.5555

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 14.9790 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 44.7932 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	29.0444	28.6228	28.2011	26.0928	25.6712	23.5629	23.5629	23.1413	24.4062	25.6712	26.5145	27.3578	(38)

Heat transfer coeff

	73.8376	73.4159	72.9943	70.8860	70.4644	68.3561	68.3561	67.9345	69.1994	70.4644	71.3077	72.1510	(39)

Average = Sum(39)m / 12 = 70.7806

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8118	0.8071	0.8025	0.7793	0.7747	0.7515	0.7515	0.7469	0.7608	0.7747	0.7839	0.7932	(40)
HLP (average)												0.7782	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6386 (42)
Hot water usage for mixer showers

68.4610	67.4321	65.9329	63.0644	60.9476	58.5869	57.2450	58.7329	60.3639	62.8986	65.8287	68.1987	(42a)

Hot water usage for baths

29.5637	29.1246	28.5063	27.3663	26.5127	25.5661	25.0549	25.6688	26.3373	27.3502	28.5137	29.4637	(42b)

Hot water usage for other uses

41.6522	40.1376	38.6230	37.1084	35.5937	34.0791	34.0791	35.5937	37.1084	38.6230	40.1376	41.6522	(42c)

Average daily hot water use (litres/day) 128.3946 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	139.6769	136.6944	133.0622	127.5391	123.0540	118.2321	116.3790	119.9955	123.8096	128.8717	134.4799	139.3147	(44)
Energy conte	221.2141	194.6510	204.5117	174.5947	165.6543	145.3802	140.7503	148.5795	152.6696	174.8777	191.5913	218.1331	(45)

Energy content (annual) Total = Sum(45)m = 2132.6075
Distribution loss (46)m = 0.15 x (45)m

33.1821	29.1976	30.6768	26.1892	24.8482	21.8070	21.1126	22.2869	22.9004	26.2317	28.7387	32.7200	(46)

Water storage loss:
Store volume 210.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.5800 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.8532 (55)
Total storage loss

26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(56)

If cylinder contains dedicated solar storage

26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

270.9257	239.5518	254.2233	222.7027	215.3659	193.4882	190.4619	198.2911	200.7776	224.5893	239.6993	267.8447	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

270.9257	239.5518	254.2233	222.7027	215.3659	193.4882	190.4619	198.2911	200.7776	224.5893	239.6993	267.8447	(64)

Total per year (kWh/year) = Sum(64)m = 2717.9215 (64)
12Total per year (kWh/year) 2718 (64)
Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)
Heat gains from water heating, kWh/month

113.3230	100.6421	107.7694	96.5391	94.8493	86.8253	86.5688	89.1720	89.2490	97.9161	102.1905	112.2985	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

145.9975	161.6401	145.9975	150.8641	145.9975	150.8641	145.9975	145.9975	150.8641	145.9975	150.8641	145.9975	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

240.8328	243.3319	237.0343	223.6274	206.7036	190.7976	180.1714	177.6723	183.9699	197.3768	214.3007	230.2066	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	(71)

Water heating gains (Table 5)

152.3158	149.7650	144.8514	134.0821	127.4857	120.5907	116.3559	119.8548	123.9570	131.6077	141.9313	150.9389	(72)

Total internal gains

601.7256	617.3165	590.4626	571.1531	542.7662	524.8319	505.1042	506.1041	521.3705	537.5615	569.6755	589.7225	(73)

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6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains

		m2	Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	factor Table 6d	W	
East		4.9800	19.6403	0.3000	0.0000	0.7700	22.5938	(76)
West		3.5300	19.6403	0.3000	0.0000	0.7700	16.0153	(80)

Solar gains	38.6090	75.5274	124.3829	181.4051	222.3188	227.5828	216.6681	186.1147	144.6625	89.6197	48.1409	31.7502	(83)
Total gains	640.3346	692.8439	714.8456	752.5582	765.0850	752.4147	721.7724	692.2188	666.0330	627.1812	617.8164	621.4727	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	29.5163	29.6858	29.8573	30.7453	30.9292	31.8832	31.8832	32.0811	31.4946	30.9292	30.5635	30.2062	
alpha	2.9678	2.9791	2.9905	3.0497	3.0619	3.1255	3.1255	3.1387	3.0996	3.0619	3.0376	3.0137	
util living area	0.9257	0.9043	0.8731	0.7999	0.6927	0.5314	0.4005	0.4303	0.6197	0.8090	0.8948	0.9301	(86)
Living	19.2059	19.4405	19.7783	20.2732	20.6431	20.8917	20.9664	20.9577	20.8146	20.3581	19.7568	19.2090	
Non living	18.5914	18.8234	19.1557	19.6451	19.9905	20.2218	20.2776	20.2761	20.1543	19.7347	19.1505	18.6062	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.0822	19.4405	19.7783	20.2732	20.6431	20.8917	20.9664	20.9577	20.8146	20.3581	19.7568	19.4595	(87)
Th 2	20.2432	20.2472	20.2512	20.2713	20.2753	20.2956	20.2956	20.2996	20.2875	20.2753	20.2673	20.2592	(88)
util rest of house	0.9178	0.8943	0.8594	0.7783	0.6591	0.4833	0.3413	0.3709	0.5731	0.7843	0.8824	0.9227	(89)
MIT 2	19.3982	18.8234	19.1557	19.6451	19.9905	20.2218	20.2776	20.2761	20.1543	19.7347	19.1505	18.8374	(90)
Living area fraction									fLA = Living area / (4) =			0.3196	(91)
MIT	19.6168	19.0206	19.3547	19.8458	20.1991	20.4359	20.4977	20.4939	20.3653	19.9339	19.3443	19.0362	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6168	19.0206	19.3547	19.8458	20.1991	20.4359	20.4977	20.4939	20.3653	19.9339	19.3443	19.0362	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9104	0.8750	0.8406	0.7644	0.6553	0.4932	0.3586	0.3877	0.5784	0.7714	0.8641	0.9082	(94)
Useful gains	582.9793	606.2386	600.8828	575.2925	501.3654	371.0947	258.8479	268.3853	385.2521	483.8220	533.8636	564.4085	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1130.9558	1036.6772	938.3184	775.9072	598.8824	398.9171	266.4323	278.1170	433.5571	657.7081	873.1091	1070.4479	(97)
Space heating kWh	407.6946	289.2547	251.0521	144.4425	72.5527	0.0000	0.0000	0.0000	0.0000	129.3713	244.2568	376.4933	(98a)
Space heating requirement - total per year (kWh/year)												1915.1180	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	407.6946	289.2547	251.0521	144.4425	72.5527	0.0000	0.0000	0.0000	0.0000	129.3713	244.2568	376.4933	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1915.1180	
Space heating per m2											(98c) / (4) =	21.0545	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Efficiency of main space heating system 1 (in %)	270.8847 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	407.6946	289.2547	251.0521	144.4425	72.5527	0.0000	0.0000	0.0000	0.0000	129.3713	244.2568	376.4933	(98)
Space heating efficiency (main heating system 1)	270.8847	270.8847	270.8847	270.8847	0.0000	0.0000	0.0000	0.0000	270.8847	270.8847	270.8847	270.8847	(210)
Space heating fuel (main heating system)	150.5048	106.7815	92.6786	53.3225	26.7836	0.0000	0.0000	0.0000	0.0000	47.7588	90.1700	138.9866	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	270.9257	239.5518	254.2233	222.7027	215.3659	193.4882	190.4619	198.2911	200.7776	224.5893	239.6993	267.8447	(64)
Efficiency of water heater												281.0493	(216)
(217)m	281.0493	281.0493	281.0493	281.0493	281.0493	281.0493	281.0493	281.0493	281.0493	281.0493	281.0493	281.0493	(217)
Fuel for water heating, kWh/month	96.3979	85.2348	90.4551	79.2397	76.6292	68.8449	67.7682	70.5539	71.4386	79.9110	85.2873	95.3017	(219)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	29.6563	26.7864	29.6563	28.6997	29.6563	28.6997	29.6563	29.6563	28.6997	29.6563	28.6997	29.6563	(231)
Lighting	30.8703	24.7653	22.2984	16.3368	12.6190	10.3098	11.5115	14.9631	19.4355	25.5005	28.8027	31.7283	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	706.9864	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	281.0493	
Water heating fuel used	967.0623	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.1900)		
mechanical ventilation fans (SFP = 1.1900)	349.1794	(230a)
Total electricity for the above, kWh/year	349.1794	(231)
Electricity for lighting (calculated in Appendix L)	249.1413	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2272.3695	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	706.9864	0.1552	109.7234	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	967.0623	0.1410	136.3181	(264)
Space and water heating			246.0414	(265)
Pumps, fans and electric keep-hot	349.1794	0.1387	48.4355	(267)
Energy for lighting	249.1413	0.1443	35.9588	(268)
Total CO2, kg/year			330.4357	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.6300	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	706.9864	1.5746	1113.1910	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	967.0623	1.5212	1471.1200	(278)
Space and water heating			2584.3110	(279)
Pumps, fans and electric keep-hot	349.1794	1.5128	528.2386	(281)
Energy for lighting	249.1413	1.5338	382.1413	(282)
Total Primary energy kWh/year			3494.6909	(286)
Dwelling Primary energy Rate (DPER)			38.4200	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	41.1800	(1b)	x 2.4800	(2b) =	102.1264	(1b) - (3b)
First floor	49.7800	(1c)	x 2.7800	(2c) =	138.3884	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	90.9600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		240.5148	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1247	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3747	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3185	(21)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4061	0.3982	0.3902	0.3504	0.3424	0.3026	0.3026	0.2946	0.3185	0.3424	0.3583	0.3743 (22b)
Effective ac	0.5825	0.5793	0.5761	0.5614	0.5586	0.5458	0.5458	0.5434	0.5507	0.5586	0.5642	0.5700 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			4.1400	1.0000	4.1400			(26)
TER Opening Type			8.5100	1.1450	9.7443			(27)
GF			41.1800	0.1300	5.3534			(28a)
Exposed Floor			8.6000	0.1300	1.1180			(28b)
Main	71.8472	12.6500	59.1972	0.1800	10.6555			(29a)
PIJ	49.7800		49.7800	0.1100	5.4758			(30)
Total net area of external elements Aum(A, m2)			171.4072					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	36.4870			(33)
Main dwelling								
Party Wall 1			81.2200	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 86.2563 (35)

List of Thermal Bridges

	Length	Psi-value	Total	
K1 Element				
E2 Other lintels (including other steel lintels)	8.6300	0.0500	0.4315	
E3 Sill	8.6300	0.0500	0.4315	
E4 Jamb	28.2000	0.0500	1.4100	
E5 Ground floor (normal)	16.6400	0.1600	2.6624	
E16 Corner (normal)	4.9600	0.0900	0.4464	
E12 Gable (insulation at ceiling level)	11.0000	0.0600	0.6600	
E6 Intermediate floor within a dwelling	11.0000	0.0000	0.0000	
E17 Corner (inverted - internal area greater than external area)	4.9600	-0.0900	-0.4464	
P1 Party wall - Ground floor	12.4600	0.0800	0.9968	
E20 Exposed floor (normal)	6.4400	0.3200	2.0608	
E21 Exposed floor (inverted)	12.0800	0.3200	3.8656	
E18 Party wall between dwellings	11.1200	0.0600	0.6672	
P4 Party wall - Roof (insulation at ceiling level)	18.1000	0.1200	2.1720	
E25 Staggered party wall between dwellings	9.9200	0.0600	0.5952	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 15.9530 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 52.4400 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	46.2302	45.9760	45.7269	44.5568	44.3378	43.3187	43.3187	43.1299	43.7112	44.3378	44.7807	45.2438	(38)
Heat transfer coeff	98.6702	98.4160	98.1669	96.9967	96.7778	95.7586	95.7586	95.5699	96.1512	96.7778	97.2207	97.6837	(39)
Average = Sum(39)m / 12 =												96.9957	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0848	1.0820	1.0792	1.0664	1.0640	1.0528	1.0528	1.0507	1.0571	1.0640	1.0688	1.0739	(40)
HLP (average)												1.0664	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6386 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	68.4610	67.4321	65.9329	63.0644	60.9476	58.5869	57.2450	58.7329	60.3639	62.8986	65.8287	68.1987	(42a)
Hot water usage for baths	29.5637	29.1246	28.5063	27.3663	26.5127	25.5661	25.0549	25.6688	26.3373	27.3502	28.5137	29.4637	(42b)
Hot water usage for other uses	41.6522	40.1376	38.6230	37.1084	35.5937	34.0791	34.0791	35.5937	37.1084	38.6230	40.1376	41.6522	(42c)
Average daily hot water use (litres/day)												128.3946	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	139.6769	136.6944	133.0622	127.5391	123.0540	118.2321	116.3790	119.9955	123.8096	128.8717	134.4799	139.3147	(44)
Energy conte	221.2141	194.6510	204.5117	174.5947	165.6543	145.3802	140.7503	148.5795	152.6696	174.8777	191.5913	218.1331	(45)
Energy content (annual)										Total = Sum(45)m =		2132.6075	
Distribution loss (46)m = 0.15 x (45)m	33.1821	29.1976	30.6768	26.1892	24.8482	21.8070	21.1126	22.2869	22.9004	26.2317	28.7387	32.7200	(46)
Water storage loss:													
Store volume												210.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7016	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.9188	(55)
Total storage loss	28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842	(56)
If cylinder contains dedicated solar storage	28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	272.9607	241.3898	256.2583	224.6720	217.4009	195.4575	192.4969	200.3261	202.7469	226.6243	241.6687	269.8797	(62)
WWHRS	-31.2975	-27.6798	-28.9847	-24.0004	-22.3675	-19.1401	-17.9408	-19.0782	-19.8031	-23.3456	-26.4477	-30.7179	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	241.6632	213.7101	227.2737	200.6716	195.0334	176.3175	174.5562	181.2479	182.9439	203.2787	215.2209	239.1618	(64)
										Total per year (kWh/year) = Sum(64)m =		2451.0786	(64)
12Total per year (kWh/year)												2451	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	114.9510	102.1125	109.3974	98.1146	96.4773	88.4008	88.1968	90.7999	90.8245	99.5441	103.7660	113.9265	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	142.2156	157.4530	142.2156	146.9561	142.2156	146.9561	142.2156	142.2156	146.9561	142.2156	146.9561	142.2156	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	240.8328	243.3319	237.0343	223.6274	206.7036	190.7976	180.1714	177.6723	183.9699	197.3768	214.3007	230.2066	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	(71)

Water heating gains (Table 5)

	154.5040	151.9532	147.0395	136.2703	129.6738	122.7789	118.5440	122.0429	126.1452	133.7959	144.1194	153.1270	(72)

Total internal gains

	603.1319	618.3176	591.8689	572.4333	544.1725	523.1121	503.5105	504.5103	519.6507	538.9678	570.9557	591.1288	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	4.9800	19.6403	0.6300	0.7000	0.7700	29.8916	(76)
West	3.5300	19.6403	0.6300	0.7000	0.7700	21.1882	(80)

Solar gains	51.0797	99.9228	164.5586	239.9990	294.1277	301.0921	286.6519	246.2298	191.3885	118.5668	63.6904	42.0055	(83)
Total gains	654.2116	718.2404	756.4276	812.4323	838.3003	824.2042	790.1625	750.7401	711.0392	657.5346	634.6461	633.1343	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	22.0878	22.1449	22.2011	22.4689	22.5197	22.7594	22.7594	22.8043	22.6665	22.5197	22.4171	22.3109	
alpha	2.4725	2.4763	2.4801	2.4979	2.5013	2.5173	2.5173	2.5203	2.5111	2.5013	2.4945	2.4874	
util living area	0.9360	0.9177	0.8901	0.8304	0.7393	0.6039	0.4758	0.5113	0.6900	0.8457	0.9133	0.9404	(86)
MIT	18.4055	18.6788	19.1165	19.7406	20.2920	20.7078	20.8849	20.8584	20.5623	19.8623	19.0543	18.3688	(87)
Th 2	20.0133	20.0156	20.0178	20.0284	20.0304	20.0396	20.0396	20.0413	20.0360	20.0304	20.0264	20.0222	(88)
util rest of house	0.9279	0.9074	0.8758	0.8069	0.7003	0.5405	0.3887	0.4252	0.6331	0.8197	0.9008	0.9329	(89)
MIT 2	16.9801	17.3251	17.8765	18.6558	19.3201	19.7941	19.9672	19.9474	19.6441	18.8191	17.8103	16.9389	(90)
Living area fraction									fLA = Living area / (4) =			0.3196	(91)
MIT	17.4357	17.7577	18.2728	19.0025	19.6307	20.0861	20.2605	20.2386	19.9375	19.1525	18.2078	17.3959	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.4357	17.7577	18.2728	19.0025	19.6307	20.0861	20.2605	20.2386	19.9375	19.1525	18.2078	17.3959	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8993	0.8764	0.8434	0.7775	0.6822	0.5438	0.4098	0.4440	0.6266	0.7911	0.8703	0.9053	(94)
Useful gains	588.3189	629.4443	637.9923	631.6314	571.9223	448.2148	323.7839	333.2941	445.5711	520.1449	552.3117	573.1478	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1296.0984	1265.4063	1155.6998	979.9051	767.5179	525.3461	350.5219	366.8520	561.2863	827.6930	1079.9121	1289.0229	(97)
Space heating kWh	526.5880	427.3664	385.1743	250.7571	145.5232	0.0000	0.0000	0.0000	0.0000	228.8158	379.8723	532.6111	(98a)
Space heating requirement - total per year (kWh/year)												2876.7082	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	526.5880	427.3664	385.1743	250.7571	145.5232	0.0000	0.0000	0.0000	228.8158	379.8723	532.6111	(98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												2876.7082	
Space heating per m2											(98c) / (4) =	31.6261	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	526.5880	427.3664	385.1743	250.7571	145.5232	0.0000	0.0000	0.0000	0.0000	228.8158	379.8723	532.6111	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	570.5179	463.0189	417.3070	271.6761	157.6632	0.0000	0.0000	0.0000	0.0000	247.9044	411.5627	577.0434	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	241.6632	213.7101	227.2737	200.6716	195.0334	176.3175	174.5562	181.2479	182.9439	203.2787	215.2209	239.1618	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.7576	85.5823	85.2328	84.5606	83.4125	79.8000	79.8000	79.8000	79.8000	84.3258	85.3199	85.8013	(217)
Fuel for water heating, kWh/month	281.7980	249.7128	266.6504	237.3110	233.8180	220.9492	218.7421	227.1276	229.2530	241.0634	252.2517	278.7391	(219)

Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	29.5496	23.7058	21.3444	15.6378	12.0791	9.8687	11.0190	14.3229	18.6040	24.4095	27.5704	30.3709	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-38.9812	-55.1702	-79.5760	-89.7571	-96.9883	-90.5718	-89.4598	-84.3870	-75.4216	-63.2498	-42.9366	-33.6769	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-21.3144	-44.9402	-89.5251	-134.7575	-178.4789	-179.4591	-177.3409	-150.0006	-109.7478	-64.3537	-28.4842	-16.8460	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	3116.6936	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2937.4164	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	238.4821	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-2035.4247	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	4343.1674	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3116.6936	0.2100	654.5057	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2937.4164	0.2100	616.8574	(264)
Space and water heating			1271.3631	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	238.4821	0.1443	34.4203	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-840.1762	0.1345	-113.0202	
PV Unit electricity exported	-1195.2485	0.1258	-150.3985	
Total			-263.4187	(269)
Total CO2, kg/year			1054.2940	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.5900	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	3116.6936	1.1300	3521.8638	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2937.4164	1.1300	3319.2805	(278)
Space and water heating			6841.1443	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	238.4821	1.5338	365.7919	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-840.1762	1.4972	-1257.8767	
PV Unit electricity exported	-1195.2485	0.4619	-552.0620	
Total			-1809.9387	(283)
Total Primary energy kWh/year			5527.0983	(286)
Target Primary Energy Rate (TPER)			60.7600	(287)

Full SAP Calculation Printout

Property Reference	78449-03	**Issued on Date**	03/10/2025
Assessment Reference	001	**Prop Type Ref**	Mid
Property	850 Rochdale Road, MANCHESTER, M9 8FA		

SAP Rating	84 B	**DER**	3.63	**TER**	11.59
Environmental	97 A	**% DER < TER**			68.68
CO_2 Emissions (t/year)	0.32	**DFEE**	34.22	**TFEE**	37.64
Compliance Check	See BREL	**% DFEE < TFEE**			9.08
% DPER < TPER	36.77	**DPER**	38.42	**TPER**	60.76

Assessor Details	Mr. Daniel Goddard	**Assessor ID**	CP52-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	41.1800 (1b)	x	2.4800 (2b)	=	102.1264	(1b) - (3b)
First floor	49.7800 (1c)	x	2.7800 (2c)	=	138.3884	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	90.9600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	240.5148	(5)

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2. Ventilation rate

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			m3 per hour	
Number of open chimneys		0 * 80 =	0.0000	(6a)
Number of open flues		0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000	(6d)
Number of flues attached to other heater		0 * 35 =	0.0000	(6e)
Number of blocked chimneys		0 * 20 =	0.0000	(6f)
Number of intermittent extract fans		0 * 10 =	0.0000	(7a)
Number of passive vents		0 * 10 =	0.0000	(7b)
Number of flueless gas fires		0 * 40 =	0.0000	(7c)
			Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		0.0000 / (5) =	0.0000	(8)
Pressure test			Yes	
Pressure Test Method			Blower Door	
Measured/design AP50			5.0000	(17)
Infiltration rate			0.2500	(18)
Number of sides sheltered			2	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.2125	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2709	0.2656	0.2603	0.2338	0.2284	0.2019	0.2019	0.1966	0.2125	0.2284	0.2391	0.2497	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	81.0000	(23c)

Effective ac	0.3659	0.3606	0.3553	0.3287	0.3234	0.2969	0.2969	0.2916	0.3075	0.3234	0.3341	0.3447	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door			4.1400	1.0000	4.1400			(26)
Window			8.5100	0.7752	6.5969			(27)
GF			41.1800	0.0900	3.7062	75.0000	3088.5000	(28a)
Exposed Floor			8.6000	0.1400	1.2040	20.0000	172.0000	(28b)
Main	71.8472	12.6500	59.1972	0.1300	7.6956	9.0000	532.7748	(29a)
PIJ	49.7800		49.7800	0.1300	6.4714	9.0000	448.0200	(30)
Total net area of external elements Aum(A, m2)			171.4072					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.8141			(33)
Main dwelling								
Party Wall 1			81.2200	0.0000	0.0000	20.0000	1624.4000	(32)
Timber			96.4800			9.0000	868.3200	(32c)
FF			41.1800			18.0000	741.2400	(32d)
GF			41.1800			9.0000	370.6200	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 7845.8748 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 86.2563 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	8.6300	0.1150	0.9925
E3 Sill	8.6300	0.0170	0.1467
E4 Jamb	28.2000	0.0940	2.6508
E5 Ground floor (normal)	16.6400	0.0670	1.1149
E16 Corner (normal)	4.9600	0.0680	0.3373
E12 Gable (insulation at ceiling level)	11.0000	0.0770	0.8470
E6 Intermediate floor within a dwelling	11.0000	0.0320	0.3520
E17 Corner (inverted - internal area greater than external area)	4.9600	-0.0290	-0.1438
P1 Party wall - Ground floor	12.4600	0.3200	3.9872
E20 Exposed floor (normal)	6.4400	0.0790	0.5088
E21 Exposed floor (inverted)	12.0800	0.0630	0.7610
E18 Party wall between dwellings	11.1200	0.0920	1.0230
P4 Party wall - Roof (insulation at ceiling level)	18.1000	0.1020	1.8462
E25 Staggered party wall between dwellings	9.9200	0.0560	0.5555

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 14.9790 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 44.7932 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	29.0444	28.6228	28.2011	26.0928	25.6712	23.5629	23.5629	23.1413	24.4062	25.6712	26.5145	27.3578	(38)
Heat transfer coeff	73.8376	73.4159	72.9943	70.8860	70.4644	68.3561	68.3561	67.9345	69.1994	70.4644	71.3077	72.1510	(39)
Average = Sum(39)m / 12 =												70.7806	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8118	0.8071	0.8025	0.7793	0.7747	0.7515	0.7515	0.7469	0.7608	0.7747	0.7839	0.7932	(40)
HLP (average)												0.7782	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6386 (42)
Hot water usage for mixer showers

68.4610	67.4321	65.9329	63.0644	60.9476	58.5869	57.2450	58.7329	60.3639	62.8986	65.8287	68.1987	(42a)

Hot water usage for baths

29.5637	29.1246	28.5063	27.3663	26.5127	25.5661	25.0549	25.6688	26.3373	27.3502	28.5137	29.4637	(42b)

Hot water usage for other uses

41.6522	40.1376	38.6230	37.1084	35.5937	34.0791	34.0791	35.5937	37.1084	38.6230	40.1376	41.6522	(42c)

Average daily hot water use (litres/day) 128.3946 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	139.6769	136.6944	133.0622	127.5391	123.0540	118.2321	116.3790	119.9955	123.8096	128.8717	134.4799	139.3147	(44)
Energy conte	221.2141	194.6510	204.5117	174.5947	165.6543	145.3802	140.7503	148.5795	152.6696	174.8777	191.5913	218.1331	(45)
Energy content (annual)										Total = Sum(45)m =		2132.6075	
Distribution loss (46)m = 0.15 x (45)m	33.1821	29.1976	30.6768	26.1892	24.8482	21.8070	21.1126	22.2869	22.9004	26.2317	28.7387	32.7200	(46)
Water storage loss:													
Store volume												210.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5800	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8532	(55)
Total storage loss	26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(56)
If cylinder contains dedicated solar storage	26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	270.9257	239.5518	254.2233	222.7027	215.3659	193.4882	190.4619	198.2911	200.7776	224.5893	239.6993	267.8447	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	270.9257	239.5518	254.2233	222.7027	215.3659	193.4882	190.4619	198.2911	200.7776	224.5893	239.6993	267.8447	(64)
										Total per year (kWh/year) = Sum(64)m =		2717.9215	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	113.3230	100.6421	107.7694	96.5391	94.8493	86.8253	86.5688	89.1720	89.2490	97.9161	102.1905	112.2985	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	35.2685	31.3252	25.4754	19.2865	14.4169	12.1713	13.1516	17.0949	22.9447	29.1336	34.0032	36.2488	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	359.4520	363.1820	353.7825	333.7722	308.5128	284.7725	268.9125	265.1825	274.5820	294.5923	319.8517	343.5920	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	(71)
Water heating gains (Table 5)	152.3158	149.7650	144.8514	134.0821	127.4857	120.5907	116.3559	119.8548	123.9570	131.6077	141.9313	150.9389	(72)
Total internal gains	653.2794	650.5153	630.3524	593.3839	556.6585	523.7777	504.6631	508.3753	527.7268	561.5767	602.0293	637.0228	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a	g Specific data	FF Specific data	Access factor	Gains W

					W/m2	or Table 6b		or Table 6c		Table 6d			
East					4.9800	19.6403		0.3000		0.0000	0.7700	22.5938	(76)
West					3.5300	19.6403		0.3000		0.0000	0.7700	16.0153	(80)
Solar gains	38.6090	75.5274	124.3829	181.4051	222.3188	227.5828	216.6681	186.1147	144.6625	89.6197	48.1409	31.7502	(83)
Total gains	691.8885	726.0427	754.7353	774.7891	778.9772	751.3605	721.3312	694.4900	672.3893	651.1964	650.1702	668.7729	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	29.5163	29.6858	29.8573	30.7453	30.9292	31.8832	31.8832	32.0811	31.4946	30.9292	30.5635	30.2062	
alpha	2.9678	2.9791	2.9905	3.0497	3.0619	3.1255	3.1255	3.1387	3.0996	3.0619	3.0376	3.0137	
util living area	0.9121	0.8945	0.8591	0.7899	0.6853	0.5320	0.4007	0.4290	0.6157	0.7964	0.8831	0.9178	(86)
Living	19.3133	19.5049	19.8465	20.3018	20.6541	20.8914	20.9663	20.9580	20.8180	20.3899	19.8174	19.3099	
Non living	18.6955	18.8852	19.2202	19.6711	19.9998	20.2215	20.2775	20.2763	20.1570	19.7633	19.2082	18.7041	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.1371	19.5049	19.8465	20.3018	20.6541	20.8914	20.9663	20.9580	20.8180	20.3899	19.8174	19.5463	(87)
Th 2	20.2432	20.2472	20.2512	20.2713	20.2753	20.2956	20.2956	20.2996	20.2875	20.2753	20.2673	20.2592	(88)
util rest of house	0.9031	0.8837	0.8444	0.7678	0.6515	0.4839	0.3415	0.3698	0.5690	0.7708	0.8697	0.9093	(89)
MIT 2	19.4514	18.8852	19.2202	19.6711	19.9998	20.2215	20.2775	20.2763	20.1570	19.7633	19.2082	18.9216	(90)
Living area fraction									fLA = Living area / (4) =			0.3196	(91)
MIT	19.6706	19.0833	19.4203	19.8726	20.2089	20.4356	20.4977	20.4941	20.3682	19.9636	19.4029	19.1213	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6706	19.0833	19.4203	19.8726	20.2089	20.4356	20.4977	20.4941	20.3682	19.9636	19.4029	19.1213	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8955	0.8643	0.8258	0.7545	0.6482	0.4938	0.3588	0.3866	0.5746	0.7587	0.8515	0.8941	(94)
Useful gains	619.5576	627.4984	623.2848	584.6008	504.9435	370.9896	258.8336	268.4813	386.3351	494.0863	553.6206	597.9674	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1134.9258	1041.2778	943.1111	777.8068	599.5755	398.8983	266.4298	278.1337	433.7576	659.7981	877.2884	1076.5852	(97)
Space heating kWh	383.4339	278.0598	237.9508	139.1083	70.4062	0.0000	0.0000	0.0000	0.0000	123.2896	233.0408	356.0916	(98a)
Space heating requirement - total per year (kWh/year)												1821.3810	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	383.4339	278.0598	237.9508	139.1083	70.4062	0.0000	0.0000	0.0000	0.0000	123.2896	233.0408	356.0916	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1821.3810	
Space heating per m2										(98c) / (4) =		20.0240	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	270.8847	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	383.4339	278.0598	237.9508	139.1083	70.4062	0.0000	0.0000	0.0000	0.0000	123.2896	233.0408	356.0916	(98)
Space heating efficiency (main heating system 1)	270.8847	270.8847	270.8847	270.8847	270.8847	0.0000	0.0000	0.0000	0.0000	270.8847	270.8847	270.8847	(210)
Space heating fuel (main heating system)	141.5488	102.6488	87.8421	51.3533	25.9912	0.0000	0.0000	0.0000	0.0000	45.5137	86.0295	131.4551	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	270.9257	239.5518	254.2233	222.7027	215.3659	193.4882	190.4619	198.2911	200.7776	224.5893	239.6993	267.8447	(64)
Efficiency of water heater												281.0493	(216)
(217)m	281.0493	281.0493	281.0493	281.0493	281.0493	281.0493	281.0493	281.0493	281.0493	281.0493	281.0493	281.0493	(217)
Fuel for water heating, kWh/month	96.3979	85.2348	90.4551	79.2397	76.6292	68.8449	67.7682	70.5539	71.4386	79.9110	85.2873	95.3017	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	29.6563	26.7864	29.6563	28.6997	29.6563	28.6997	29.6563	29.6563	28.6997	29.6563	28.6997	29.6563	(231)
Lighting	30.8703	24.7653	22.2984	16.3368	12.6190	10.3098	11.5115	14.9631	19.4355	25.5005	28.8027	31.7283	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	672.3824	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	281.0493	
Water heating fuel used	967.0623	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.1900)		
mechanical ventilation fans (SFP = 1.1900)	349.1794	(230a)
Total electricity for the above, kWh/year	349.1794	(231)
Electricity for lighting (calculated in Appendix L)	249.1413	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2237.7655	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	672.3824	16.4900	110.8759	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	967.0623	16.4900	159.4686	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	349.1794	16.4900	57.5797	(249)
Energy for lighting	249.1413	16.4900	41.0834	(250)
Additional standing charges			0.0000	(251)
Total energy cost			369.0075	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.9771	(257)
SAP value		84.1617	
SAP rating (Section 12)		84	(258)
SAP band		B	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	672.3824	0.1551	104.3180	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	967.0623	0.1410	136.3181	(264)
Space and water heating			240.6360	(265)
Pumps, fans and electric keep-hot	349.1794	0.1387	48.4355	(267)
Energy for lighting	249.1413	0.1443	35.9588	(268)
Total CO2, kg/year			325.0303	(272)
CO2 emissions per m2			3.5700	(273)
EI value			96.7966	
EI rating			97	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	41.1800 (1b)	x	2.4800 (2b)	=	102.1264	(1b) - (3b)
First floor	49.7800 (1c)	x	2.7800 (2c)	=	138.3884	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 90.9600						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	240.5148	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.2500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2125	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.6000	4.5000	4.5000	4.1000	4.2000	3.7000	3.5000	3.5000	3.7000	4.1000	4.1000	4.2000	(22)
Wind factor	1.1500	1.1250	1.1250	1.0250	1.0500	0.9250	0.8750	0.8750	0.9250	1.0250	1.0250	1.0500	(22a)
Adj infilt rate													
	0.2444	0.2391	0.2391	0.2178	0.2231	0.1966	0.1859	0.1859	0.1966	0.2178	0.2178	0.2231	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	81.0000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.3394	0.3341	0.3341	0.3128	0.3181	0.2916	0.2809	0.2809	0.2916	0.3128	0.3128	0.3181	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Door			4.1400	1.0000	4.1400			(26)
Window			8.5100	0.7752	6.5969			(27)
GF			41.1800	0.0900	3.7062	75.0000	3088.5000	(28a)
Exposed Floor			8.6000	0.1400	1.2040	20.0000	172.0000	(28b)
Main	71.8472	12.6500	59.1972	0.1300	7.6956	9.0000	532.7748	(29a)
PIJ	49.7800		49.7800	0.1300	6.4714	9.0000	448.0200	(30)
Total net area of external elements Aum(A, m2)			171.4072					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.8141			(33)
Main dwelling								
Party Wall 1			81.2200	0.0000	0.0000	20.0000	1624.4000	(32)
Timber			96.4800			9.0000	868.3200	(32c)
FF			41.1800			18.0000	741.2400	(32d)
GF			41.1800			9.0000	370.6200	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	7845.8748 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		86.2563 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	8.6300	0.1150	0.9925
E3 Sill	8.6300	0.0170	0.1467
E4 Jamb	28.2000	0.0940	2.6508
E5 Ground floor (normal)	16.6400	0.0670	1.1149
E16 Corner (normal)	4.9600	0.0680	0.3373
E12 Gable (insulation at ceiling level)	11.0000	0.0770	0.8470
E6 Intermediate floor within a dwelling	11.0000	0.0320	0.3520
E17 Corner (inverted - internal area greater than external area)	4.9600	-0.0290	-0.1438
P1 Party wall - Ground floor	12.4600	0.3200	3.9872
E20 Exposed floor (normal)	6.4400	0.0790	0.5088
E21 Exposed floor (inverted)	12.0800	0.0630	0.7610
E18 Party wall between dwellings	11.1200	0.0920	1.0230
P4 Party wall - Roof (insulation at ceiling level)	18.1000	0.1020	1.8462
E25 Staggered party wall between dwellings	9.9200	0.0560	0.5555

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		14.9790 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	44.7932 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	26.9362	26.5145	26.5145	24.8279	25.2495	23.1413	22.2980	22.2980	23.1413	24.8279	24.8279	25.2495	(38)
Heat transfer coeff													
	71.7293	71.3077	71.3077	69.6211	70.0427	67.9345	67.0912	67.0912	67.9345	69.6211	69.6211	70.0427	(39)
Average = Sum(39)m / 12 =												69.4454	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7886	0.7839	0.7839	0.7654	0.7700	0.7469	0.7376	0.7376	0.7469	0.7654	0.7654	0.7700	(40)
HLP (average)												0.7635	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.6386	(42)

Hot water usage for mixer showers

68.4610	67.4321	65.9329	63.0644	60.9476	58.5869	57.2450	58.7329	60.3639	62.8986	65.8287	68.1987	(42a)

Hot water usage for baths

29.5637	29.1246	28.5063	27.3663	26.5127	25.5661	25.0549	25.6688	26.3373	27.3502	28.5137	29.4637	(42b)

Hot water usage for other uses

41.6522	40.1376	38.6230	37.1084	35.5937	34.0791	34.0791	35.5937	37.1084	38.6230	40.1376	41.6522	(42c)

Average daily hot water use (litres/day)	128.3946	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	139.6769	136.6944	133.0622	127.5391	123.0540	118.2321	116.3790	119.9955	123.8096	128.8717	134.4799	139.3147	(44)
Energy conte	221.2141	194.6510	204.5117	174.5947	165.6543	145.3802	140.7503	148.5795	152.6696	174.8777	191.5913	218.1331	(45)
Energy content (annual)										Total = Sum(45)m =		2132.6075	
Distribution loss (46)m = 0.15 x (45)m													
	33.1821	29.1976	30.6768	26.1892	24.8482	21.8070	21.1126	22.2869	22.9004	26.2317	28.7387	32.7200	(46)

Water storage loss:		
Store volume	210.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):	1.5800	(48)
Temperature factor from Table 2b	0.5400	(49)
Enter (49) or (54) in (55)	0.8532	(55)

Total storage loss

26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(56)

If cylinder contains dedicated solar storage

26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(57)

Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	270.9257	239.5518	254.2233	222.7027	215.3659	193.4882	190.4619	198.2911	200.7776	224.5893	239.6993	267.8447	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	270.9257	239.5518	254.2233	222.7027	215.3659	193.4882	190.4619	198.2911	200.7776	224.5893	239.6993	267.8447	(64)
										Total per year (kWh/year) = Sum(64)m =		2717.9215	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	113.3230	100.6421	107.7694	96.5391	94.8493	86.8253	86.5688	89.1720	89.2490	97.9161	102.1905	112.2985	(65)

5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	35.2685	31.3252	25.4754	19.2865	14.4169	12.1713	13.1516	17.0949	22.9447	29.1336	34.0032	36.2488	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	359.4520	363.1820	353.7825	333.7722	308.5128	284.7725	268.9125	265.1825	274.5820	294.5923	319.8517	343.5920	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	(71)
Water heating gains (Table 5)													
	152.3158	149.7650	144.8514	134.0821	127.4857	120.5907	116.3559	119.8548	123.9570	131.6077	141.9313	150.9389	(72)
Total internal gains													
	653.2794	650.5153	630.3524	593.3839	556.6585	523.7777	504.6631	508.3753	527.7268	561.5767	602.0293	637.0228	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	4.9800	16.6187	0.3000	0.0000	0.7700	19.1178	(76)
West	3.5300	16.6187	0.3000	0.0000	0.7700	13.5514	(80)

Solar gains	32.6692	67.1355	116.6090	172.9395	207.2659	216.2037	201.7650	170.7039	137.1149	82.8303	42.3057	28.7264	(83)
Total gains	685.9486	717.6508	746.9614	766.3235	763.9244	739.9813	706.4281	679.0793	664.8417	644.4070	644.3350	665.7491	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	30.3838	30.5635	30.5635	31.3039	31.1154	32.0811	32.4843	32.4843	32.0811	31.3039	31.3039	31.1154	
alpha	3.0256	3.0376	3.0376	3.0869	3.0744	3.1387	3.1656	3.1656	3.1387	3.0869	3.0869	3.0744	
util living area													
	0.9068	0.8885	0.8547	0.7779	0.6639	0.5092	0.4021	0.4249	0.6142	0.7907	0.8753	0.9119	(86)
Living	19.4513	19.6333	19.9188	20.3753	20.7083	20.9113	20.9677	20.9614	20.8259	20.4264	19.9252	19.4545	
Non living	18.8455	19.0256	19.3024	19.7502	20.0520	20.2411	20.2904	20.2865	20.1745	19.8040	19.3250	18.8607	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.2077	19.6333	19.9188	20.3753	20.7083	20.9113	20.9677	20.9614	20.8259	20.4264	19.9252	19.6707	(87)
Th 2	20.2632	20.2673	20.2673	20.2834	20.2794	20.2996	20.3077	20.3077	20.2996	20.2834	20.2834	20.2794	(88)
util rest of house													
	0.8972	0.8771	0.8397	0.7545	0.6273	0.4591	0.3436	0.3654	0.5682	0.7644	0.8610	0.9028	(89)
MIT 2	19.5380	19.0256	19.3024	19.7502	20.0520	20.2411	20.2904	20.2865	20.1745	19.8040	19.3250	19.0592	(90)
Living area fraction										fLA = Living area / (4) =		0.3196	(91)
MIT	19.7520	19.2198	19.4994	19.9500	20.2617	20.4553	20.5069	20.5022	20.3827	20.0029	19.5168	19.2546	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7520	19.2198	19.4994	19.9500	20.2617	20.4553	20.5069	20.5022	20.3827	20.0029	19.5168	19.2546	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8898	0.8583	0.8219	0.7427	0.6263	0.4706	0.3608	0.3825	0.5739	0.7531	0.8436	0.8880	(94)
Useful gains	610.3675	615.9874	613.9316	569.1664	478.4751	348.2089	254.8526	259.7206	381.5666	485.3317	543.5328	591.1572	(95)
Ext temp.	4.7000	5.3000	6.7000	9.3000	12.3000	15.0000	16.6000	16.5000	14.1000	10.8000	7.5000	4.6000	(96)
Heat loss rate W													
	1079.6717	992.5909	912.6936	741.4636	557.6596	370.6022	262.1157	268.5111	426.8125	640.7179	836.6232	1026.4484	(97)
Space heating kWh													
	349.1623	253.0776	222.2789	124.0540	58.9133	0.0000	0.0000	0.0000	0.0000	115.6073	211.0251	323.8566	(98a)
Space heating requirement - total per year (kWh/year)												1657.9750	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	349.1623	253.0776	222.2789	124.0540	58.9133	0.0000	0.0000	0.0000	0.0000	115.6073	211.0251	323.8566	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1657.9750	
Space heating per m2											(98c) / (4) =	18.2275	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												269.9311	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	349.1623	253.0776	222.2789	124.0540	58.9133	0.0000	0.0000	0.0000	0.0000	115.6073	211.0251	323.8566	(98)
Space heating efficiency (main heating system 1)													
	269.9311	269.9311	269.9311	269.9311	269.9311	0.0000	0.0000	0.0000	0.0000	269.9311	269.9311	269.9311	(210)
Space heating fuel (main heating system)													
	129.3524	93.7564	82.3465	45.9576	21.8253	0.0000	0.0000	0.0000	0.0000	42.8284	78.1774	119.9775	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	270.9257	239.5518	254.2233	222.7027	215.3659	193.4882	190.4619	198.2911	200.7776	224.5893	239.6993	267.8447	(64)
Efficiency of water heater												281.3569	(216)
(217)m	281.3569	281.3569	281.3569	281.3569	281.3569	281.3569	281.3569	281.3569	281.3569	281.3569	281.3569	281.3569	(217)
Fuel for water heating, kWh/month													
	96.2925	85.1416	90.3562	79.1531	76.5455	68.7697	67.6941	70.4767	71.3605	79.8236	85.1940	95.1975	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	29.6563	26.7864	29.6563	28.6997	29.6563	28.6997	29.6563	29.6563	28.6997	29.6563	28.6997	29.6563	(231)
Lighting	30.8703	24.7653	22.2984	16.3368	12.6190	10.3098	11.5115	14.9631	19.4355	25.5005	28.8027	31.7283	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												614.2216	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												281.3569	
Water heating fuel used												966.0048	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.1900)													
mechanical ventilation fans (SFP = 1.1900)												349.1794	(230a)
Total electricity for the above, kWh/year												349.1794	(231)
Electricity for lighting (calculated in Appendix L)												249.1413	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												2178.5472	(238)

10a. Fuel costs - using BEDF prices (583)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	614.2216	28.4300	174.6232	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	966.0048	28.4300	274.6352	(247)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(247a)
Pumps, fans and electric keep-hot	349.1794	28.4300	99.2717	(249)
Energy for lighting	249.1413	28.4300	70.8309	(250)
Additional standing charges			0.0000	(251)
Total energy cost			619.3610	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	614.2216	0.1552	95.3232	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	966.0048	0.1410	136.1690	(264)
Space and water heating			231.4921	(265)
Pumps, fans and electric keep-hot	349.1794	0.1387	48.4355	(267)
Energy for lighting	249.1413	0.1443	35.9588	(268)
Total CO2, kg/year			315.8864	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	614.2216	1.5746	967.1236	(275)
Total CO2 associated with community systems			0.0000	(473)

Water heating (other fuel)	966.0048	1.5212	1469.5113 (278)
Space and water heating			2436.6349 (279)
Pumps, fans and electric keep-hot	349.1794	1.5128	528.2386 (281)
Energy for lighting	249.1413	1.5338	382.1413 (282)
Total Primary energy kWh/year			3347.0147 (286)

SAP 10 EPC IMPROVEMENTS

001

Current energy efficiency rating: B 84
Current environmental impact rating: A 97

N Solar water heating	Recommended
U Solar photovoltaic panels	Recommended
V2 Wind turbine	Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
N Solar water heating	+ 1.4	-£ 53	-23 kg (7.2%)
U Solar photovoltaic panels	+ 8.2	-£ 277	-207 kg (70.6%)

	Typical annual savings		Energy efficiency	Environmental impact
Recommended measures				
Solar water heating	£53	0.25 kg/m²	B 86	A 97
Solar photovoltaic panels	£277	2.27 kg/m²	A 94	A 99
Total Savings	£330	2.52 kg/m²		

Potential energy efficiency rating: A 94
Potential environmental impact rating: A 99

Fuel prices for cost data on this page from database revision number 583 TEST (01 Oct 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, West Pennines (England)):

	Current	Potential	Saving
Electricity	£619	£567	£53
Space heating	£274	£300	-£26
Water heating	£275	£196	£78
Lighting	£71	£71	£0
Generated (PV)	-£0	-£277	£277
Total cost of fuels	£619	£290	£330
Total cost of uses	£620	£290	£329
Delivered energy	24 kWh/m²	4 kWh/m²	20 kWh/m²
Carbon dioxide emissions	0.3 tonnes	0.1 tonnes	0.2 tonnes
CO2 emissions per m²	3 kg/m²	1 kg/m²	3 kg/m²
Primary energy	37 kWh/m²	17 kWh/m²	20 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	41.1800 (1b)	x	2.4800 (2b)	=	102.1264	(1b) - (3b)
First floor	49.7800 (1c)	x	2.7800 (2c)	=	138.3884	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	90.9600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	240.5148	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.2500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2125	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													
	0.2709	0.2656	0.2603	0.2338	0.2284	0.2019	0.2019	0.1966	0.2125	0.2284	0.2391	0.2497	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	81.0000	(23c)

Effective ac	0.3659	0.3606	0.3553	0.3287	0.3234	0.2969	0.2969	0.2916	0.3075	0.3234	0.3341	0.3447	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Door			4.1400	1.0000	4.1400			(26)
Window			8.5100	0.7752	6.5969			(27)
GF			41.1800	0.0900	3.7062	75.0000	3088.5000	(28a)
Exposed Floor			8.6000	0.1400	1.2040	20.0000	172.0000	(28b)
Main	71.8472	12.6500	59.1972	0.1300	7.6956	9.0000	532.7748	(29a)
PIJ	49.7800		49.7800	0.1300	6.4714	9.0000	448.0200	(30)
Total net area of external elements Aum(A, m2)			171.4072					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.8141			(33)
Main dwelling								
Party Wall 1			81.2200	0.0000	0.0000	20.0000	1624.4000	(32)
Timber			96.4800			9.0000	868.3200	(32c)
FF			41.1800			18.0000	741.2400	(32d)
GF			41.1800			9.0000	370.6200	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 7845.8748	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	86.2563	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	8.6300	0.1150	0.9925
E3 Sill	8.6300	0.0170	0.1467
E4 Jamb	28.2000	0.0940	2.6508
E5 Ground floor (normal)	16.6400	0.0670	1.1149
E16 Corner (normal)	4.9600	0.0680	0.3373
E12 Gable (insulation at ceiling level)	11.0000	0.0770	0.8470
E6 Intermediate floor within a dwelling	11.0000	0.0320	0.3520
E17 Corner (inverted - internal area greater than external area)	4.9600	-0.0290	-0.1438
P1 Party wall - Ground floor	12.4600	0.3200	3.9872
E20 Exposed floor (normal)	6.4400	0.0790	0.5088
E21 Exposed floor (inverted)	12.0800	0.0630	0.7610
E18 Party wall between dwellings	11.1200	0.0920	1.0230
P4 Party wall - Roof (insulation at ceiling level)	18.1000	0.1020	1.8462
E25 Staggered party wall between dwellings	9.9200	0.0560	0.5555

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	14.9790	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	44.7932	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	29.0444	28.6228	28.2011	26.0928	25.6712	23.5629	23.5629	23.1413	24.4062	25.6712	26.5145	27.3578	(38)
Heat transfer coeff													
	73.8376	73.4159	72.9943	70.8860	70.4644	68.3561	68.3561	67.9345	69.1994	70.4644	71.3077	72.1510	(39)
Average = Sum(39)m / 12 =												70.7806	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8118	0.8071	0.8025	0.7793	0.7747	0.7515	0.7515	0.7469	0.7608	0.7747	0.7839	0.7932	(40)
HLP (average)												0.7782	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.6386	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
68.4610	67.4321	65.9329	63.0644	60.9476	58.5869	57.2450	58.7329	60.3639	62.8986	65.8287	68.1987	(42a)

Hot water usage for baths

29.5637	29.1246	28.5063	27.3663	26.5127	25.5661	25.0549	25.6688	26.3373	27.3502	28.5137	29.4637	(42b)

Hot water usage for other uses

41.6522	40.1376	38.6230	37.1084	35.5937	34.0791	34.0791	35.5937	37.1084	38.6230	40.1376	41.6522	(42c)

Average daily hot water use (litres/day)	128.3946	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	139.6769	136.6944	133.0622	127.5391	123.0540	118.2321	116.3790	119.9955	123.8096	128.8717	134.4799	139.3147	(44)
Energy conte	221.2141	194.6510	204.5117	174.5947	165.6543	145.3802	140.7503	148.5795	152.6696	174.8777	191.5913	218.1331	(45)
Energy content (annual)											Total = Sum(45)m =	2132.6075	
Distribution loss (46)m = 0.15 x (45)m													
	33.1821	29.1976	30.6768	26.1892	24.8482	21.8070	21.1126	22.2869	22.9004	26.2317	28.7387	32.7200	(46)

Water storage loss:		
Store volume	210.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):	1.5800	(48)
Temperature factor from Table 2b	0.5400	(49)
Enter (49) or (54) in (55)	0.8532	(55)

Total storage loss

26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(56)

If cylinder contains dedicated solar storage

17.0031	15.3576	17.0031	16.4546	17.0031	16.4546	17.0031	17.0031	16.4546	17.0031	16.4546	17.0031	(57)
Primary loss 23.2624	21.0112	21.8667	15.7584	10.4681	9.9053	10.2355	11.1660	17.1091	21.8667	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

261.4795	231.0198	243.3814	206.8077	193.1255	171.7400	167.9889	176.7485	186.2333	213.7474	230.5579	258.3985	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)

Aperture area of solar collector	3.0000	(H1)
Zero-loss collector efficiency	0.8000	(H2)
Collector linear heat loss coefficient	1.8000	(H3)
Collector 2nd order heat loss coefficient	0.0000	(H4)
Collector loop efficiency	0.9000	(H5)
Incidence angle modifier	1.0000	(H6)

Overshading factor												0.8000	(H8)
Overall heat loss coefficient of system												6.5000	(H10)
Heat loss coefficient of collector loop												3.9667	(H11)
Dedicated solar storage volume												75.0000	(H12)
If combined cylinder, total volume of cylinder												210.0000	(H13)
Effective solar volume												115.5000	(H14)
Reference volume												225.0000	(H15)
Storage tank correction coefficient												1.1814	(H16)
Heat delivered to hot water												654.6757	(H24)
Heat delivered to space heating												0.0000	(H29)
Solar input												654.6757	
Solar input	-0.0000	-20.1906	-62.4438	-83.8682	-107.6151	-99.0457	-98.2732	-86.8675	-61.6791	-33.2791	-1.4133	-0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	261.4795	210.8291	180.9377	122.9394	85.5104	72.6943	69.7156	89.8809	124.5542	180.4683	229.1446	258.3985	(64)
									Total per year (kWh/year) = Sum(64)m =			1886.5527	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
								Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =				0.0000	(64a)
Heat gains from water heating, kWh/month													
	105.7660	93.8165	99.0959	83.8231	77.0570	69.4268	68.5903	71.9379	77.6136	89.2426	94.8774	104.7416	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	35.2685	31.3252	25.4754	19.2865	14.4169	12.1713	13.1516	17.0949	22.9447	29.1336	34.0032	36.2488	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	359.4520	363.1820	353.7825	333.7722	308.5128	284.7725	268.9125	265.1825	274.5820	294.5923	319.8517	343.5920	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	(71)
Water heating gains (Table 5)													
	142.1587	139.6079	133.1934	116.4210	103.5712	96.4261	92.1913	96.6907	107.7967	119.9497	131.7741	140.7817	(72)
Total internal gains													
	643.1223	640.3582	618.6944	575.7228	532.7440	499.6131	480.4985	485.2112	511.5665	549.9188	591.8722	626.8656	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	4.9800	19.6403	0.3000	0.0000	0.7700	22.5938	(76)
West	3.5300	19.6403	0.3000	0.0000	0.7700	16.0153	(80)

Solar gains	38.6090	75.5274	124.3829	181.4051	222.3188	227.5828	216.6681	186.1147	144.6625	89.6197	48.1409	31.7502	(83)
Total gains	681.7313	715.8856	743.0774	757.1279	755.0628	727.1959	697.1666	671.3260	656.2290	639.5384	640.0131	658.6158	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	29.5163	29.6858	29.8573	30.7453	30.9292	31.8832	31.8832	32.0811	31.4946	30.9292	30.5635	30.2062	
alpha	2.9678	2.9791	2.9905	3.0497	3.0619	3.1255	3.1255	3.1387	3.0996	3.0619	3.0376	3.0137	
util living area													
	0.9149	0.8975	0.8632	0.7979	0.6981	0.5458	0.4131	0.4419	0.6261	0.8025	0.8868	0.9205	(86)
Living	19.2926	19.4854	19.8269	20.2792	20.6349	20.8832	20.9633	20.9544	20.8091	20.3747	19.7986	19.2886	
Non living	18.6754	18.8666	19.2017	19.6505	19.9836	20.2157	20.2759	20.2741	20.1501	19.7496	19.1904	18.6835	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.1265	19.4854	19.8269	20.2792	20.6349	20.8832	20.9633	20.9544	20.8091	20.3747	19.7986	19.5280	(87)
Th 2	20.2432	20.2472	20.2512	20.2713	20.2753	20.2956	20.2956	20.2996	20.2875	20.2753	20.2673	20.2592	(88)
util rest of house													
	0.9060	0.8870	0.8488	0.7761	0.6646	0.4972	0.3525	0.3814	0.5794	0.7774	0.8737	0.9123	(89)
MIT 2	19.4412	18.8666	19.2017	19.6505	19.9836	20.2157	20.2759	20.2741	20.1501	19.7496	19.1904	18.9039	(90)
Living area fraction										fLA = Living area / (4) =		0.3196	(91)
MIT	19.6602	19.0644	19.4015	19.8514	20.1917	20.4290	20.4956	20.4915	20.3607	19.9494	19.3848	19.1034	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6602	19.0644	19.4015	19.8514	20.1917	20.4290	20.4956	20.4915	20.3607	19.9494	19.3848	19.1034	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8985	0.8676	0.8301	0.7624	0.6605	0.5067	0.3701	0.3984	0.5845	0.7649	0.8555	0.8972	(94)
Useful gains	612.5056	621.0786	616.8621	577.2369	498.7053	368.4672	258.0023	267.4529	383.5338	489.1698	547.5142	590.8996	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1134.1604	1039.8893	941.7389	776.3046	598.3657	398.4481	266.2854	277.9551	433.2382	658.7983	875.9978	1075.2926	(97)
Space heating kWh													
	388.1112	281.4408	241.7084	143.3288	74.1473	0.0000	0.0000	0.0000	0.0000	126.2036	236.5082	360.3884	(98a)
Space heating requirement - total per year (kWh/year)												1851.8366	
Solar heating kWh													
	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	388.1112	281.4408	241.7084	143.3288	74.1473	0.0000	0.0000	0.0000	0.0000	126.2036	236.5082	360.3884	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1851.8366	
Space heating per m2											(98c) / (4) =	20.3588	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												270.8847	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	388.1112	281.4408	241.7084	143.3288	74.1473	0.0000	0.0000	0.0000	0.0000	126.2036	236.5082	360.3884	(98)
Space heating efficiency (main heating system 1)													
	270.8847	270.8847	270.8847	270.8847	270.8847	0.0000	0.0000	0.0000	0.0000	270.8847	270.8847	270.8847	(210)
Space heating fuel (main heating system)													
	143.2754	103.8969	89.2293	52.9114	27.3723	0.0000	0.0000	0.0000	0.0000	46.5894	87.3095	133.0413	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	261.4795	210.8291	180.9377	122.9394	85.5104	72.6943	69.7156	89.8809	124.5542	180.4683	229.1446	258.3985	(64)
Efficiency of water heater												281.0493	(216)
(217)m	281.0493	281.0493	281.0493	281.0493	281.0493	281.0493	281.0493	281.0493	281.0493	281.0493	281.0493	281.0493	(217)
Fuel for water heating, kWh/month													
	93.0369	75.0150	64.3793	43.7430	30.4254	25.8653	24.8055	31.9805	44.3176	64.2123	81.5318	91.9407	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	36.4509	32.9233	36.4509	35.2750	36.4509	35.2750	36.4509	36.4509	35.2750	36.4509	35.2750	36.4509	(231)
Lighting	30.8703	24.7653	22.2984	16.3368	12.6190	10.3098	11.5115	14.9631	19.4355	25.5005	28.8027	31.7283	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-37.4213	-55.2968	-82.6096	-94.8967	-102.3683	-93.3004	-92.1878	-86.5597	-76.2056	-63.7310	-41.7430	-31.9501	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-12.6652	-28.2832	-59.7367	-95.8754	-133.3145	-138.4133	-136.4638	-113.2143	-80.2575	-43.1148	-17.6668	-9.9637	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												683.6254	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												281.0493	
Water heating fuel used												671.2534	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.1900)													
mechanical ventilation fans (SFP = 1.1900)												349.1794	(230a)
pump for solar water heating												80.0000	(230g)
Total electricity for the above, kWh/year												429.1794	(231)
Electricity for lighting (calculated in Appendix L)												249.1413	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1727.2394	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												305.9602	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	683.6254	16.4900	112.7298	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	671.2534	16.4900	110.6897	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	349.1794	16.4900	57.5797	(249)
Pump for solar water heating	80.0000	16.4900	13.1920	(249)
Energy for lighting	249.1413	16.4900	41.0834	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-858.2703	16.4900	-141.5288	
PV Unit electricity exported	-868.9691	5.5900	-48.5754	
Total			-190.1041	(252)
Total energy cost			145.1705	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.3844	(257)
SAP value		93.7691	
SAP rating (Section 12)		94	(258)
SAP band		A	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	683.6254	0.1551	106.0146	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	671.2534	0.1462	98.1652	(264)
Space and water heating			204.1797	(265)
Pumps, fans and electric keep-hot	429.1794	0.1387	59.5325	(267)
Energy for lighting	249.1413	0.1443	35.9588	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-858.2703	0.1343	-115.2684	
PV Unit electricity exported	-868.9691	0.1239	-107.6587	
Total			-222.9271	(269)
Total CO2, kg/year			76.7439	(272)
CO2 emissions per m2			0.8400	(273)
EI value			99.2436	
EI rating			99	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	41.1800	(1b) x	2.4800	(2b) =	102.1264	(1b) - (3b)
First floor	49.7800	(1c) x	2.7800	(2c) =	138.3884	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	90.9600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		240.5148	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.2500 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2125 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.6000	4.5000	4.5000	4.1000	4.2000	3.7000	3.5000	3.5000	3.7000	4.1000	4.1000	4.2000	(22)
Wind factor	1.1500	1.1250	1.1250	1.0250	1.0500	0.9250	0.8750	0.8750	0.9250	1.0250	1.0250	1.0500	(22a)
Adj infilt rate	0.2444	0.2391	0.2391	0.2178	0.2231	0.1966	0.1859	0.1859	0.1966	0.2178	0.2178	0.2231	(22b)
Balanced mechanical ventilation with heat recovery													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												81.0000	(23c)
Effective ac	0.3394	0.3341	0.3341	0.3128	0.3181	0.2916	0.2809	0.2809	0.2916	0.3128	0.3128	0.3181	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door			4.1400	1.0000	4.1400			(26)
Window			8.5100	0.7752	6.5969			(27)
GF			41.1800	0.0900	3.7062	75.0000	3088.5000	(28a)
Exposed Floor			8.6000	0.1400	1.2040	20.0000	172.0000	(28b)
Main	71.8472	12.6500	59.1972	0.1300	7.6956	9.0000	532.7748	(29a)
PIJ	49.7800		49.7800	0.1300	6.4714	9.0000	448.0200	(30)
Total net area of external elements Aum(A, m2)			171.4072					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.8141			(33)
Main dwelling								
Party Wall 1			81.2200	0.0000	0.0000	20.0000	1624.4000	(32)
Timber			96.4800			9.0000	868.3200	(32c)
FF			41.1800			18.0000	741.2400	(32d)
GF			41.1800			9.0000	370.6200	(32e)
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =			7845.8748	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 86.2563 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	8.6300	0.1150	0.9925
E3 Sill	8.6300	0.0170	0.1467
E4 Jamb	28.2000	0.0940	2.6508
E5 Ground floor (normal)	16.6400	0.0670	1.1149
E16 Corner (normal)	4.9600	0.0680	0.3373
E12 Gable (insulation at ceiling level)	11.0000	0.0770	0.8470
E6 Intermediate floor within a dwelling	11.0000	0.0320	0.3520
E17 Corner (inverted - internal area greater than external area)	4.9600	-0.0290	-0.1438
P1 Party wall - Ground floor	12.4600	0.3200	3.9872
E20 Exposed floor (normal)	6.4400	0.0790	0.5088
E21 Exposed floor (inverted)	12.0800	0.0630	0.7610
E18 Party wall between dwellings	11.1200	0.0920	1.0230
P4 Party wall - Roof (insulation at ceiling level)	18.1000	0.1020	1.8462
E25 Staggered party wall between dwellings	9.9200	0.0560	0.5555

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 14.9790 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 44.7932 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	26.9362	26.5145	26.5145	24.8279	25.2495	23.1413	22.2980	22.2980	23.1413	24.8279	24.8279	25.2495	(38)
Heat transfer coeff	71.7293	71.3077	71.3077	69.6211	70.0427	67.9345	67.0912	67.0912	67.9345	69.6211	69.6211	70.0427	(39)
Average = Sum(39)m / 12 =												69.4454	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7886	0.7839	0.7839	0.7654	0.7700	0.7469	0.7376	0.7376	0.7469	0.7654	0.7654	0.7700	(40)
HLP (average)												0.7635	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6386 (42)
Hot water usage for mixer showers

68.4610	67.4321	65.9329	63.0644	60.9476	58.5869	57.2450	58.7329	60.3639	62.8986	65.8287	68.1987	(42a)

Hot water usage for baths

29.5637	29.1246	28.5063	27.3663	26.5127	25.5661	25.0549	25.6688	26.3373	27.3502	28.5137	29.4637	(42b)

Hot water usage for other uses

41.6522	40.1376	38.6230	37.1084	35.5937	34.0791	34.0791	35.5937	37.1084	38.6230	40.1376	41.6522	(42c)

Average daily hot water use (litres/day) 128.3946 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	139.6769	136.6944	133.0622	127.5391	123.0540	118.2321	116.3790	119.9955	123.8096	128.8717	134.4799	139.3147	(44)
Energy conte	221.2141	194.6510	204.5117	174.5947	165.6543	145.3802	140.7503	148.5795	152.6696	174.8777	191.5913	218.1331	(45)
Energy content (annual)										Total = Sum(45)m =		2132.6075	

Distribution loss (46)m = 0.15 x (45)m

33.1821	29.1976	30.6768	26.1892	24.8482	21.8070	21.1126	22.2869	22.9004	26.2317	28.7387	32.7200	(46)

Water storage loss:
Store volume 210.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.5800 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.8532 (55)
Total storage loss

26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(56)

If cylinder contains dedicated solar storage

17.0031	15.3576	17.0031	16.4546	17.0031	16.4546	17.0031	17.0031	16.4546	17.0031	16.4546	17.0031	(57)
23.2624	21.0112	21.8667	15.7584	10.4681	9.9053	10.2355	11.1660	17.1091	21.8667	22.5120	23.2624	(59)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

261.4795	231.0198	243.3814	206.8077	193.1255	171.7400	167.9889	176.7485	186.2333	213.7474	230.5579	258.3985	(62)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)

Aperture area of solar collector 3.0000 (H1)
Zero-loss collector efficiency 0.8000 (H2)
Collector linear heat loss coefficient 1.8000 (H3)
Collector 2nd order heat loss coefficient 0.0000 (H4)
Collector loop efficiency 0.9000 (H5)
Incidence angle modifier 1.0000 (H6)
Overshading factor 0.8000 (H8)
Overall heat loss coefficient of system 6.5000 (H10)
Heat loss coefficient of collector loop 3.9667 (H11)
Dedicated solar storage volume 75.0000 (H12)
If combined cylinder, total volume of cylinder 210.0000 (H13)
Effective solar volume 115.5000 (H14)
Reference volume 225.0000 (H15)
Storage tank correction coefficient 1.1814 (H16)
Heat delivered to hot water 599.1897 (H24)
Heat delivered to space heating 0.0000 (H29)
Solar input 599.1897

-0.0000	-14.4822	-56.8249	-79.3403	-100.2904	-94.0949	-90.8995	-78.3168	-56.9604	-27.9802	-0.0000	-0.0000	(63c)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

261.4795	216.5376	186.5565	127.4673	92.8350	77.6451	77.0894	98.4317	129.2728	185.7672	230.5579	258.3985	(64)
									Total per year (kWh/year) = Sum(64)m =		1942.0387	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)

Heat gains from water heating, kWh/month

105.7660	93.8165	99.0959	83.8231	77.0570	69.4268	68.5903	71.9379	77.6136	89.2426	94.8774	104.7416	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	35.2685	31.3252	25.4754	19.2865	14.4169	12.1713	13.1516	17.0949	22.9447	29.1336	34.0032	36.2488	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	359.4520	363.1820	353.7825	333.7722	308.5128	284.7725	268.9125	265.1825	274.5820	294.5923	319.8517	343.5920	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	(69)

Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	(71)
Water heating gains (Table 5)	142.1587	139.6079	133.1934	116.4210	103.5712	96.4261	92.1913	96.6907	107.7967	119.9497	131.7741	140.7817	(72)
Total internal gains	643.1223	640.3582	618.6944	575.7228	532.7440	499.6131	480.4985	485.2112	511.5665	549.9188	591.8722	626.8656	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	4.9800	16.6187	0.3000	0.0000	0.7700	19.1178	(76)
West	3.5300	16.6187	0.3000	0.0000	0.7700	13.5514	(80)

Solar gains	32.6692	67.1355	116.6090	172.9395	207.2659	216.2037	201.7650	170.7039	137.1149	82.8303	42.3057	28.7264	(83)
Total gains	675.7915	707.4937	735.3035	748.6623	740.0099	715.8167	682.2635	655.9152	648.6814	632.7491	634.1778	655.5920	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	30.3838	30.5635	30.5635	31.3039	31.1154	32.0811	32.4843	32.4843	32.0811	31.3039	31.3039	31.1154	
alpha	3.0256	3.0376	3.0376	3.0869	3.0744	3.1387	3.1656	3.1656	3.1387	3.0869	3.0869	3.0744	
util living area	0.9097	0.8917	0.8591	0.7862	0.6771	0.5231	0.4148	0.4381	0.6248	0.7970	0.8793	0.9148	(86)
Living	19.4308	19.6142	19.8995	20.3539	20.6910	20.9043	20.9647	20.9579	20.8171	20.4115	19.9069	19.4335	
Non living	18.8258	19.0073	19.2842	19.7308	20.0377	20.2363	20.2887	20.2845	20.1678	19.7907	19.3077	18.8405	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.1973	19.6142	19.8995	20.3539	20.6910	20.9043	20.9647	20.9579	20.8171	20.4115	19.9069	19.6526	(87)
Th 2	20.2632	20.2673	20.2673	20.2834	20.2794	20.2996	20.3077	20.3077	20.2996	20.2834	20.2834	20.2794	(88)
util rest of house	0.9004	0.8806	0.8443	0.7633	0.6408	0.4723	0.3550	0.3772	0.5788	0.7711	0.8653	0.9060	(89)
MIT 2	19.5279	19.0073	19.2842	19.7308	20.0377	20.2363	20.2887	20.2845	20.1678	19.7907	19.3077	19.0418	(90)
Living area fraction									fLA = Living area / (4) =			0.3196	(91)
MIT	19.7418	19.2013	19.4809	19.9299	20.2465	20.4498	20.5048	20.4997	20.3753	19.9891	19.4992	19.2370	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7418	19.2013	19.4809	19.9299	20.2465	20.4498	20.5048	20.4997	20.3753	19.9891	19.4992	19.2370	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8930	0.8618	0.8264	0.7509	0.6390	0.4835	0.3723	0.3945	0.5840	0.7595	0.8478	0.8912	(94)
Useful gains	603.4859	609.7347	607.6374	562.2002	472.8993	346.0816	254.0301	258.7483	378.8167	480.5478	537.6294	584.2708	(95)
Ext temp.	4.7000	5.3000	6.7000	9.3000	12.3000	15.0000	16.6000	16.5000	14.1000	10.8000	7.5000	4.6000	(96)
Heat loss rate W	1078.9393	991.2675	911.3729	740.0682	556.5933	370.2267	261.9745	268.3436	426.3094	639.7559	835.3990	1025.2150	(97)
Space heating kWh	353.7374	256.3901	225.9792	128.0650	62.2683	0.0000	0.0000	0.0000	0.0000	118.4508	214.3941	328.0625	(98a)
Space heating requirement - total per year (kWh/year)												1687.3474	
Solar heating kWh	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	353.7374	256.3901	225.9792	128.0650	62.2683	0.0000	0.0000	0.0000	0.0000	118.4508	214.3941	328.0625	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1687.3474	
Space heating per m2											(98c) / (4) =	18.5504	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	269.9311	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	353.7374	256.3901	225.9792	128.0650	62.2683	0.0000	0.0000	0.0000	0.0000	118.4508	214.3941	328.0625	(98)
Space heating efficiency (main heating system 1)	269.9311	269.9311	269.9311	269.9311	269.9311	0.0000	0.0000	0.0000	0.0000	269.9311	269.9311	269.9311	(210)
Space heating fuel (main heating system)	131.0473	94.9835	83.7174	47.4436	23.0682	0.0000	0.0000	0.0000	0.0000	43.8819	79.4255	121.5357	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	261.4795	216.5376	186.5565	127.4673	92.8350	77.6451	77.0894	98.4317	129.2728	185.7672	230.5579	258.3985	(64)
Efficiency of water heater												281.3569	(216)
(217)m	281.3569	281.3569	281.3569	281.3569	281.3569	281.3569	281.3569	281.3569	281.3569	281.3569	281.3569	281.3569	(217)
Fuel for water heating, kWh/month	92.9352	76.9619	66.3060	45.3045	32.9955	27.5967	27.3991	34.9846	45.9462	66.0255	81.9450	91.8401	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	36.4509	32.9233	36.4509	35.2750	36.4509	35.2750	36.4509	36.4509	35.2750	36.4509	35.2750	36.4509	(231)
Lighting	30.8703	24.7653	22.2984	16.3368	12.6190	10.3098	11.5115	14.9631	19.4355	25.5005	28.8027	31.7283	(232)

Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-32.3344	-50.2115	-78.6710	-91.6951	-98.0812	-90.9873	-89.0335	-82.6503	-73.7830	-60.0829	-37.4203	-29.2209 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-10.0465	-24.0818	-54.7786	-90.1742	-121.6439	-129.1407	-123.8907	-100.5819	-74.5168	-38.6686	-14.7883	-8.7012 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year		
Space heating fuel - main system 1	625.1031	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	281.3569	
Water heating fuel used	690.2402	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.1900)		
mechanical ventilation fans (SFP = 1.1900)	349.1794	(230a)
pump for solar water heating	80.0000	(230g)
Total electricity for the above, kWh/year	429.1794	(231)
Electricity for lighting (calculated in Appendix L)	249.1413	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1605.1846	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	388.4794	(238)

10a. Fuel costs - using BEDF prices (583)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	625.1031	28.4300	177.7168	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	690.2402	28.4300	196.2353	(247)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(247a)
Pumps, fans and electric keep-hot	349.1794	28.4300	99.2717	(249)
Pump for solar water heating	80.0000	28.4300	22.7440	(249)
Energy for lighting	249.1413	28.4300	70.8309	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-814.1715	28.4300	-231.4690	
PV Unit electricity exported	-791.0131	5.8100	-45.9579	
Total			-277.4268	(252)
Total energy cost			289.3718	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	625.1031	0.1551	96.9678	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	690.2402	0.1458	100.6408	(264)
Space and water heating			197.6086	(265)
Pumps, fans and electric keep-hot	429.1794	0.1387	59.5325	(267)
Energy for lighting	249.1413	0.1443	35.9588	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-814.1715	0.1339	-109.0444	
PV Unit electricity exported	-791.0131	0.1236	-97.8071	
Total			-206.8515	(269)
Total CO2, kg/year			86.2483	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	625.1031	1.5743	984.0930	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	690.2402	1.5394	1062.5234	(278)
Space and water heating			2046.6164	(279)
Pumps, fans and electric keep-hot	429.1794	1.5128	649.2626	(281)
Energy for lighting	249.1413	1.5338	382.1413	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-814.1715	1.4950	-1217.1654	
PV Unit electricity exported	-791.0131	0.4538	-358.9670	
Total			-1576.1324	(283)
Total Primary energy kWh/year			1501.8879	(286)

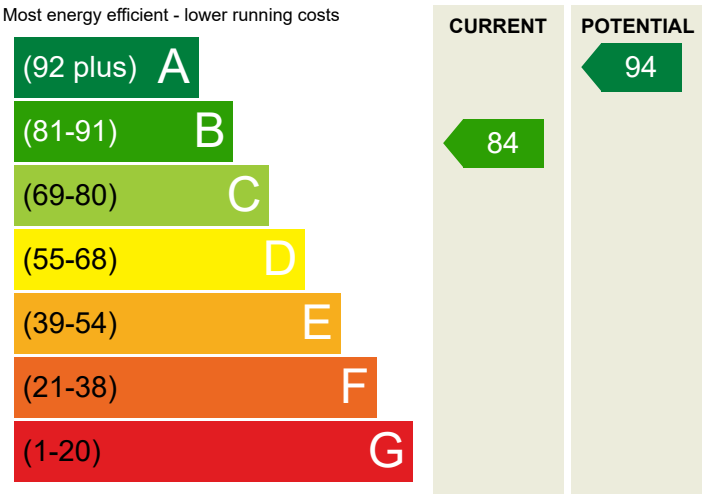
Energy Report

Dwelling Address	850 Rochdale Road, MANCHESTER, M9 8FA
Reference	78449-03-001
Assessment Date	02/07/2025
Submission Date	
Property Type	House, Mid-Terrace
Total Floor Area	91

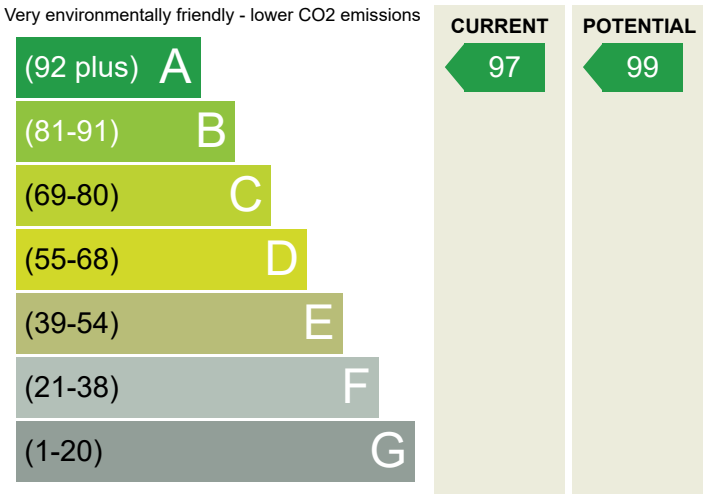
This Energy Report has been generated using the UK's National Calculation Methodology for dwellings, Standard Assessment Procedure (SAP). This methodology is used to assess the energy efficiency of dwellings which is calculated based on a dwelling's heating, hot water, ventilation and lighting usage.

This document is not an Energy Performance Certificate (EPC) as required by the Energy Performance of Buildings Regulations

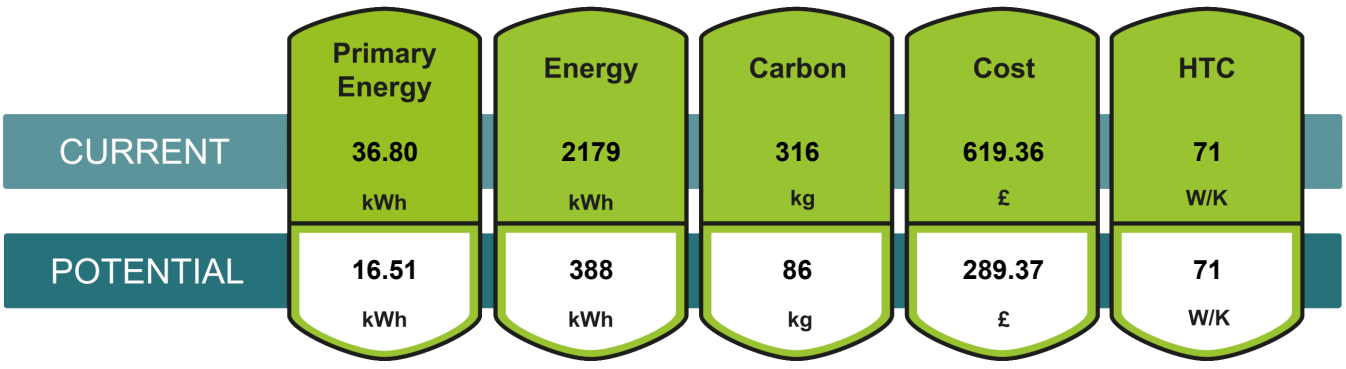
Energy Efficiency Rating



Carbon Dioxide (CO2) Emissions Rating



Additional ratings for your home



Energy Report

Breakdown of property's energy performance

Each feature is assessed as one of the following:

Very Poor | Poor | Average | Good | Very Good

Feature	Description	Energy Performance
Walls	Average thermal transmittance 0.13 W/m²K	Very Good
Roof	Average thermal transmittance 0.13 W/m²K	Very Good
Floor	Average thermal transmittance 0.1 W/m²K	Very Good
Windows	High performance glazing	Very Good
Main heating	Air source heat pump, radiators, electric	Good
Main heating controls	Programmer, room thermostat and TRVs	Good
Secondary heating	None	
Hot water	From main system	Good
Lighting	Good lighting efficiency	Good
Air tightness	Air permeability [AP50] = 5.0 m³/h.m² (as tested)	Good

Recommendations

The recommended measures provided below will help to improve the energy efficiency of the dwelling.
To reach the dwelling's potential energy rating all of the recommended measures shown below would need to be installed.
Having these measures installed individually or in any other order may give a different result when compared with the cumulative potential rating.

Recommended measures	Cumulative savings (per year)	Cumulative rating	Typical costs	Incremental savings (per year)	Cumulative CO2 rating
Solar water heating	£53	B 86	£4,000 - £7,000	£53	A 97
Photovoltaic	£330	A 94	£8,000 - £10,000	£277	A 99

Energy Report

The typical cost is based on average installation prices across the country so may not be representative of the actual costs in your area.

Estimated energy costs of the dwelling

The table below shows the estimated running costs of the space and water heating and lighting within the dwelling. It does not include the energy used from household appliances. The estimated annual costs after potential improvements indicates the total energy cost if all recommended measures named above were installed.

	Estimated annual costs	Estimated annual costs after potential improvements	Potential future savings
Lighting	£71	£71	
Heating	£274	£300	
Hot Water	£275	£196	
New Technologies e.g. Impact of PV	£0	-(£277)	
TOTAL	£619	£289	

Estimated energy use and potential savings

Space Heating
614
kWh per year

Water Heating
966
kWh per year

Energy Report

About this document

Created by:	
Company/Trading name:	
Phone number:	
Email address:	

Disclaimer

This Energy Report should not under any circumstances be treated as a Condition Survey and cannot be used to indicate that any element of the dwelling (e.g.heating system) is working correctly.
This Energy Report must not be used in situations where an Energy Performance Certificate (EPC) is required.
This Energy Report is generated from a set of data inputs which may not reflect the actual dimensions, services or construction of the dwelling.
The calculation used to generate this report reflects the SAP Methodology current at the time of report generation.

Glossary terms for additional metrics

Primary Energy	The measure of the energy required for lighting, heating and hot water in a property. This includes the efficiency of the property's heating system, power station efficiency for electricity and the energy used to produce the fuel and deliver it to the property.
Energy Used	The estimated amount of fuel energy for lighting, heating and hot water for the property. The estimate is based on typical usage which is likely to be different to actual consumption.
Carbon (CO2)	The current emissions based on the energy estimates.
Cost	The estimated cost of energy. The cost of each unit of fuel is based on an industry standard which is likely to be different to those the occupier actually pays.
Heat Transfer Coefficient	Heat flow through the property envelope where internal and external temperatures are different.

Building Regulations England Part L (BREL) Compliance Report

Approved Document L1 2021 Edition, England assessed by Array SAP 10 program, Array

Date: Fri 03 Oct 2025 15:03:26

Project Information			
Assessed By	Paul Goddard	Building Type	House, End-terrace
OCDEA Registration	EES/005113	Assessment Date	2025-10-03

Dwelling Details			
Assessment Type	As built	Total Floor Area	120 m^2
Site Reference	78449-04	Plot Reference	001
Address	848 Rochdale Road, MANCHESTER, M9 8FA		

Client Details	
Name	-
Company	John Southworth
Address	Unit 10, Charles Street, DUKINFIELD, SK16 4SD

This report covers items included within the SAP calculations. It is not a complete report of regulations compliance.

1a Target emission rate and dwelling emission rate		
Fuel for main heating system	Electricity	
Target carbon dioxide emission rate	*10.76 $kgCO_2/m^2$*	
Dwelling carbon dioxide emission rate	3.33 $kgCO_2/m^2$	OK
1b Target primary energy rate and dwelling primary energy		
Target primary energy	*56.43 kWh_{PE}/m^2*	
Dwelling primary energy	35.22 kWh_{PE}/m^2	OK
1c Target fabric energy efficiency and dwelling fabric energy efficiency		
Target fabric energy efficiency	*38.5 kWh/m^2*	
Dwelling fabric energy efficiency	33.4 kWh/m^2	OK

2a Fabric U-values				
Element	***Maximum permitted average U-Value [W/m^2K]***	**Dwelling average U-Value [W/m^2K]**	**Element with highest individual U-Value**	
External walls	*0.26*	0.13	Walls (1) (0.13)	OK
Party walls	*0.2*	0	Party Wall (1) (0)	**N/A**
Curtain walls	*1.6*	0	N/A	**N/A**
Floors	*0.18*	0.09	Exposed Floor (0.14)	OK
Roofs	*0.16*	0.11	Roof (1) (0.13)	OK
Windows, doors, and roof windows	*1.6*	0.85	Front (1)	OK
Rooflights	*2.2*	N/A	N/A	**N/A**

2b Envelope elements (better than typically expected values are flagged with a subsequent (!))		
Name	**Net area [m^2]**	**U-Value [W/m^2K]**
Exposed wall: Walls (1)	120.97	0.13 **(!)**
Exposed wall: Walls (2)	16.77	0.09 **(!)**
Party wall: Party Wall (1)	40.63	0 **(!)**
Ground floor: GF, GF	47.06	0.09 **(!)**
Upper floor: Exposed Floor, Exposed Floor	2.72	0.14
Exposed roof: Roof (1)	15.51	0.13
Exposed roof: Roof (2)	12.23	0.13
Exposed roof: Roof (3)	26.38	0.09 **(!)**

2c Openings (better than typically expected values are flagged with a subsequent (!))				
Name	**Area [m^2]**	**Orientation**	**Frame factor**	**U-Value [W/m^2K]**
Front, Door	1.99	East	N/A	1 **(!)**
Front, Window	5.8	East	1.0	0.8 **(!)**
Rear, Window	2.81	West	1.0	0.8 **(!)**
Rear, Door	2.15	West	N/A	1 **(!)**
Side, Window	2.36	South	1.0	0.8 **(!)**

2d Thermal bridging (better than typically expected values are flagged with a subsequent (!))
Building part **1**: Thermal bridging calculated from linear thermal transmittances for each junction

Main element	Junction detail	Source	Psi value [W/mK]	Drawing / reference
External wall	E2: Other lintels (including other steel lintels)	Calculated by person with suitable expertise	0.115	Thermal Bridge Report
External wall	E3: Sill	Calculated by person with suitable expertise	0.017 **(!)**	Thermal Bridge Report
External wall	E4: Jamb	Calculated by person with suitable expertise	0.094	Thermal Bridge Report
External wall	E5: Ground floor (normal)	Calculated by person with suitable expertise	0.067	Thermal Bridge Report
External wall	E11: Eaves (insulation at rafter level)	Calculated by person with suitable expertise	0.025 **(!)**	Thermal Bridge Report
External wall	E16: Corner (normal)	Calculated by person with suitable expertise	0.068	Thermal Bridge Report
External wall	E12: Gable (insulation at ceiling level)	Calculated by person with suitable expertise	0.077	Thermal Bridge Report
External wall	E6: Intermediate floor within a dwelling	Calculated by person with suitable expertise	0.032 **(!)**	Thermal Bridge Report
External wall	E17: Corner (inverted - internal area greater than external area)	Calculated by person with suitable expertise	-0.029 **(!)**	Thermal Bridge Report
Party wall	P1: Ground floor	SAP table default	0.32	K1
External wall	E20: Exposed floor (normal)	Calculated by person with suitable expertise	0.079	Thermal Bridge Report
External wall	E21: Exposed floor (inverted)	Calculated by person with suitable expertise	0.063	Thermal Bridge Report
External wall	E13: Gable (insulation at rafter level)	Calculated by person with suitable expertise	0.074	Thermal Bridge Report
External wall	E18: Party wall between dwellings	Calculated by person with suitable expertise	0.092	Thermal Bridge Report
Roof	R6: Flat ceiling	Calculated by person with suitable expertise	-0.043	Thermal Bridge Report
External wall	E25: Staggered party wall between dwellings	Calculated by person with suitable expertise	0.056	Thermal Bridge Report

3 Air permeability (better than typically expected values are flagged with a subsequent (!))		
Maximum permitted air permeability at 50Pa	*8 m^3/hm^2*	
Dwelling air permeability at 50Pa	5 m^3/hm^2, Measured value	OK
Air permeability test certificate reference		

4 Space heating	
Main heating system 1: Heat pump with radiators or underfloor heating - Electricity	
Efficiency	281.4%
Emitter type	Radiators
Flow temperature	45°C
System type	
Manufacturer	Daikin Europe NV
Model	EDLA09DA3V3
Commissioning	
Secondary heating system: N/A	
Fuel	N/A
Efficiency	N/A
Commissioning	

5 Hot water	
Cylinder/store - type: Cylinder	
Capacity	210 litres
Declared heat loss	1.58 kWh/day
Primary pipework insulated	Yes
Manufacturer	
Model	
Commissioning	
Waste water heat recovery system 1 - type: N/A	
Efficiency	
Manufacturer	
Model	

6 Controls		
Main heating 1 - type: Programmer, room thermostat and TRVs		
Function		
Ecodesign class		
Manufacturer		
Model		
Water heating - type: Cylinder thermostat and HW separately timed		
Manufacturer		
Model		

7 Lighting		
Minimum permitted light source efficacy	*75 lm/W*	
Lowest light source efficacy	80 lm/W	OK
External lights control	N/A	

8 Mechanical ventilation		
System type: Balanced whole-house mechanical ventilation with heat recovery		
Maximum permitted specific fan power	*1.5 W/(l/s)*	
Specific fan power	0.97 W/(l/s)	OK
Minimum permitted heat recovery efficiency	*73%*	
Heat recovery efficiency	89%	OK
Manufacturer/Model	DV110 Adroit	
Commissioning		

9 Local generation
N/A

10 Heat networks
N/A

11 Supporting documentary evidence	
Documentary evidence identified in 11.1 and 11.2 is needed to confirm the data values used for any calculations undertaken, manufacturer declarations made, and tests performed as reflected in this "As built" BREL Compliance Report are correct. 11.1 SAP Conventions, Appendix 1 (documentary evidence) schedules the minimum documentary evidence required. 11.2 Indicative photographic evidence of key stages during construction (guidance within Approved Document L, Volume 1 – Appendix B) that confirms the products identified in this BREL Compliance Report are used in this dwelling, and workmanship is of sufficient quality to support the calculated values claimed in 2a to 2d.	

12 Declarations	
a. Assessor Declaration	
This declaration by the assessor is confirmation that the contents of this BREL Compliance Report are a true and accurate reflection based upon the design and construction information submitted for this dwelling for the purpose of carrying out the assessment, and that the supporting documentary evidence (identified in 11.1 and 11.2) pursuant to Part L of the Building Regulations 2010 (as amended) has been reviewed in the course of preparing this BREL Compliance Report.	
Signed: Name:	Assessor ID: Date:
b. Client Declaration	
This declaration by the client is confirmation that the dwelling has been constructed and completed according to the specifications set out in this BREL Compliance Report, and that photographic evidence of key stages, as described in 11.2, has been provided to the Assessor for this dwelling.	
Signed: Name:	Organisation: Date:

Full SAP Calculation Printout

Property Reference	78449-04	**Issued on Date**	03/10/2025
Assessment Reference	001	**Prop Type Ref**	End
Property	848 Rochdale Road, MANCHESTER, M9 8FA		

SAP Rating	84 B	**DER**	3.33	**TER**	10.76
Environmental	97 A	**% DER < TER**			69.05
CO_2 Emissions (t/year)	0.38	**DFEE**	33.44	**TFEE**	38.50
Compliance Check	See BREL	**% DFEE < TFEE**			13.15
% DPER < TPER	37.58	**DPER**	35.22	**TPER**	56.43

Assessor Details	Mr. Daniel Goddard	**Assessor ID**	CP52-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.0600 (1b)	x	2.4800 (2b)	=	116.7088	(1b) - (3b)
First floor	49.7800 (1c)	x	2.7800 (2c)	=	138.3884	(1c) - (3c)
Second floor	23.4000 (1d)	x	2.7700 (2d)	=	64.8180	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	120.2400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	319.9152	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.2500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2125	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2709	0.2656	0.2603	0.2338	0.2284	0.2019	0.2019	0.1966	0.2125	0.2284	0.2391	0.2497	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	80.1000 (23c)

Effective ac	0.3704	0.3651	0.3598	0.3332	0.3279	0.3014	0.3014	0.2961	0.3120	0.3279	0.3386	0.3492	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door			4.1400	1.0000	4.1400			(26)
Window			10.9700	0.7752	8.5039			(27)
GF			47.0600	0.0900	4.2354	75.0000	3529.5000	(28a)
Exposed Floor			2.7200	0.1400	0.3808	20.0000	54.4000	(28b)
Main	136.0800	15.1100	120.9700	0.1300	15.7261	9.0000	1088.7300	(29a)
Dwarf Wall (PIRx0.72)	16.7700		16.7700	0.0900	1.5093	9.0000	150.9300	(29a)
PIJ	15.5100		15.5100	0.1300	2.0163	9.0000	139.5900	(30)
PIR	12.2300		12.2300	0.1300	1.5899	9.0000	110.0700	(30)
Residual Ceiling	26.3800		26.3800	0.0900	2.3742	9.0000	237.4200	(30)
Total net area of external elements Aum(A, m2)			256.7500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		40.4759			(33)
Main dwelling								
Party Wall 1			40.6300	0.0000	0.0000	20.0000	812.6000	(32)

Timber	124.1700		9.0000	1117.5300 (32c)
FF	47.0600		18.0000	847.0800 (32d)
SF	23.4000		18.0000	421.2000 (32d)
GF	47.0600		9.0000	423.5400 (32e)
FF	23.4000		9.0000	210.6000 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 9143.1900 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 76.0412 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	10.6900	0.1150	1.2293
E3 Sill	10.6900	0.0170	0.1817
E4 Jamb	35.4000	0.0940	3.3276
E5 Ground floor (normal)	22.8600	0.0670	1.5316
E11 Eaves (insulation at rafter level)	18.1000	0.0250	0.4525
E16 Corner (normal)	29.0400	0.0680	1.9747
E12 Gable (insulation at ceiling level)	5.6600	0.0770	0.4358
E6 Intermediate floor within a dwelling	39.5500	0.0320	1.2656
E17 Corner (inverted - internal area greater than external area)	2.4800	-0.0290	-0.0719
P1 Party wall - Ground floor	6.2400	0.3200	1.9968
E20 Exposed floor (normal)	3.3800	0.0790	0.2670
E21 Exposed floor (inverted)	3.3800	0.0630	0.2129
E13 Gable (insulation at rafter level)	8.2800	0.0740	0.6127
E18 Party wall between dwellings	5.5600	0.0920	0.5115
R6 Flat ceiling	18.1000	-0.0430	-0.7783
E25 Staggered party wall between dwellings	4.9600	0.0560	0.2778

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 13.4275 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 53.9034 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	39.1078	38.5470	37.9861	35.1819	34.6210	31.8168	31.8168	31.2559	32.9385	34.6210	35.7427	36.8644	(38)
Heat transfer coeff	93.0112	92.4503	91.8895	89.0852	88.5244	85.7201	85.7201	85.1593	86.8418	88.5244	89.6461	90.7678	(39)

Average = Sum(39)m / 12 = 88.9450

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7735	0.7689	0.7642	0.7409	0.7362	0.7129	0.7129	0.7082	0.7222	0.7362	0.7456	0.7549	(40)
HLP (average)												0.7397	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.8642 (42)
Hot water usage for mixer showers

72.2437	71.1580	69.5759	66.5490	64.3151	61.8240	60.4080	61.9781	63.6992	66.3739	69.4659	71.9669	(42a)

Hot water usage for baths

31.1904	30.7271	30.0748	28.8721	27.9715	26.9729	26.4334	27.0812	27.7865	28.8550	30.0826	31.0849	(42b)

Hot water usage for other uses

43.9627	42.3640	40.7654	39.1667	37.5681	35.9694	35.9694	37.5681	39.1667	40.7654	42.3640	43.9627	(42c)

Average daily hot water use (litres/day) 135.4907 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	147.3967	144.2491	140.4161	134.5878	129.8547	124.7663	122.8109	126.6274	130.6524	135.9943	141.9125	147.0144	(44)
Energy conte	233.4403	205.4088	215.8143	184.2439	174.8094	153.4147	148.5292	156.7911	161.1075	184.5430	202.1803	230.1891	(45)
Energy content (annual)										Total = Sum(45)m =		2250.4717	
Distribution loss (46)m = 0.15 x (45)m	35.0160	30.8113	32.3722	27.6366	26.2214	23.0122	22.2794	23.5187	24.1661	27.6815	30.3271	34.5284	(46)
Water storage loss:													
Store volume												210.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5800	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8532	(55)
Total storage loss	26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(56)
If cylinder contains dedicated solar storage	26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	283.1519	250.3096	265.5259	232.3519	224.5210	201.5227	198.2408	206.5027	209.2155	234.2546	250.2883	279.9007	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	283.1519	250.3096	265.5259	232.3519	224.5210	201.5227	198.2408	206.5027	209.2155	234.2546	250.2883	279.9007	(64)
										Total per year (kWh/year) = Sum(64)m =		2835.7857	(64)
12Total per year (kWh/year)												2836	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	117.3882	104.2191	111.5276	99.7475	97.8934	89.4968	89.1552	91.9023	92.0546	101.1298	105.7114	116.3071	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	173.9086	192.5416	173.9086	179.7055	173.9086	179.7055	173.9086	173.9086	179.7055	173.9086	179.7055	173.9086	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	285.5253	288.4881	281.0218	265.1269	245.0625	226.2048	213.6066	210.6438	218.1101	234.0050	254.0694	272.9272	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	(71)
Water heating gains (Table 5)	157.7798	155.0879	149.9026	138.5382	131.5771	124.3011	119.8323	123.5246	127.8537	135.9272	146.8213	156.3268	(72)
Total internal gains	683.1772	702.0812	670.7966	649.3342	616.5118	596.1749	573.3110	574.0405	591.6328	609.8043	646.5598	669.1261	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	5.8000	19.6403	0.3000	0.0000	0.7700	26.3140	(76)
South	2.3600	46.7521	0.3000	0.0000	0.7700	25.4874	(78)
West	2.8100	19.6403	0.3000	0.0000	0.7700	12.7487	(80)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	64.5501	118.1567	179.0161	243.6322	287.5543	290.5234	278.0979	245.4860	201.9064	135.6952	78.9178	54.1467	(83)
Total gains	747.7273	820.2379	849.8127	892.9664	904.0661	886.6983	851.4090	819.5266	793.5392	745.4994	725.4776	723.2728	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	27.3061	27.4718	27.6395	28.5095	28.6901	29.6287	29.6287	29.8238	29.2460	28.6901	28.3311	27.9810	
alpha	2.8204	2.8315	2.8426	2.9006	2.9127	2.9752	2.9752	2.9883	2.9497	2.9127	2.8887	2.8654	
util living area	0.9297	0.9075	0.8773	0.8089	0.7086	0.5523	0.4202	0.4490	0.6346	0.8169	0.9003	0.9343	(86)
Living	18.9939	19.2566	19.6220	20.1555	20.5653	20.8583	20.9533	20.9426	20.7709	20.2583	19.5950	18.9970	
Non living	18.4155	18.6757	19.0363	19.5662	19.9536	20.2289	20.3028	20.2996	20.1510	19.6734	19.0255	18.4301	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	19.9738	19.2566	19.6220	20.1555	20.5653	20.8583	20.9533	20.9426	20.7709	20.2583	19.5950	19.2772	(87)
Th 2	20.2763	20.2804	20.2845	20.3048	20.3089	20.3294	20.3294	20.3336	20.3212	20.3089	20.3008	20.2926	(88)
util rest of house	0.9228	0.8986	0.8651	0.7895	0.6779	0.5068	0.3625	0.3916	0.5913	0.7947	0.8894	0.9279	(89)
MIT 2	19.3244	18.6757	19.0363	19.5662	19.9536	20.2289	20.3028	20.2996	20.1510	19.6734	19.0255	18.6906	(90)
Living area fraction										fLA = Living area / (4) =		0.2917	(91)
MIT	19.5138	18.8451	19.2072	19.7381	20.1321	20.4125	20.4926	20.4872	20.3318	19.8440	19.1917	18.8617	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5138	18.8451	19.2072	19.7381	20.1321	20.4125	20.4926	20.4872	20.3318	19.8440	19.1917	18.8617	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9145	0.8772	0.8435	0.7719	0.6694	0.5126	0.3769	0.4052	0.5920	0.7780	0.8688	0.9121	(94)
Useful gains	683.7978	719.4962	716.8464	689.2955	605.2247	454.5457	320.8652	332.0421	469.7881	580.0068	630.2904	659.7148	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1415.0565	1289.2330	1167.6571	965.5185	746.4449	498.2492	333.6747	348.0640	541.1839	818.3223	1083.9702	1330.8134	(97)
Space heating kWh	544.0565	382.8631	335.4032	198.8806	105.0678	0.0000	0.0000	0.0000	0.0000	177.3067	326.6495	499.2973	(98a)
Space heating requirement - total per year (kWh/year)												2569.5247	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	544.0565	382.8631	335.4032	198.8806	105.0678	0.0000	0.0000	0.0000	0.0000	177.3067	326.6495	499.2973	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2569.5247	
Space heating per m2											(98c) / (4) =	21.3700	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Efficiency of main space heating system 1 (in %)	281.3941 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	544.0565	382.8631	335.4032	198.8806	105.0678	0.0000	0.0000	0.0000	0.0000	177.3067	326.6495	499.2973	(98)
Space heating efficiency (main heating system 1)	281.3941	281.3941	281.3941	281.3941	281.3941	0.0000	0.0000	0.0000	0.0000	281.3941	281.3941	281.3941	(210)
Space heating fuel (main heating system)	193.3433	136.0594	119.1934	70.6769	37.3383	0.0000	0.0000	0.0000	0.0000	63.0101	116.0826	177.4370	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	283.1519	250.3096	265.5259	232.3519	224.5210	201.5227	198.2408	206.5027	209.2155	234.2546	250.2883	279.9007	(64)
Efficiency of water heater												279.7109	(216)
(217)m	279.7109	279.7109	279.7109	279.7109	279.7109	279.7109	279.7109	279.7109	279.7109	279.7109	279.7109	279.7109	(217)
Fuel for water heating, kWh/month	101.2302	89.4887	94.9287	83.0686	80.2689	72.0468	70.8734	73.8272	74.7970	83.7488	89.4811	100.0678	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	45.0156	40.6593	45.0156	43.5635	45.0156	43.5635	45.0156	45.0156	43.5635	45.0156	43.5635	45.0156	(231)
Lighting	36.6415	29.3952	26.4671	19.3909	14.9781	12.2373	13.6635	17.7604	23.0690	30.2678	34.1874	37.6599	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)

Electricity generated by PVs (Appendix M) (negative quantity)

(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year		
Space heating fuel - main system 1	913.1410	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	279.7109	
Water heating fuel used	1013.8274	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.3580)		
mechanical ventilation fans (SFP = 1.3580)	530.0227	(230a)
Total electricity for the above, kWh/year	530.0227	(231)
Electricity for lighting (calculated in Appendix L)	295.7182	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2752.7093	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	913.1410	0.1550	141.5766	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1013.8274	0.1410	142.9361	(264)
Space and water heating			284.5127	(265)
Pumps, fans and electric keep-hot	530.0227	0.1387	73.5207	(267)
Energy for lighting	295.7182	0.1443	42.6813	(268)
Total CO2, kg/year			400.7146	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.3300	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	913.1410	1.5740	1437.2644	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1013.8274	1.5213	1542.3577	(278)
Space and water heating			2979.6221	(279)
Pumps, fans and electric keep-hot	530.0227	1.5128	801.8183	(281)
Energy for lighting	295.7182	1.5338	453.5824	(282)
Total Primary energy kWh/year			4235.0228	(286)
Dwelling Primary energy Rate (DPER)			35.2200	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.0600 (1b)	x	2.4800 (2b)	=	116.7088	(1b) - (3b)
First floor	49.7800 (1c)	x	2.7800 (2c)	=	138.3884	(1c) - (3c)
Second floor	23.4000 (1d)	x	2.7700 (2d)	=	64.8180	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	120.2400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	319.9152	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	4 * 10 =	40.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1250	(8)
Pressure test		Yes	

Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.3750	(18)
Number of sides sheltered	2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3188	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4064	0.3985	0.3905	0.3507	0.3427	0.3028	0.3028	0.2949	0.3188	0.3427	0.3586	0.3746	(22b)
Effective ac	0.5826	0.5794	0.5762	0.5615	0.5587	0.5459	0.5459	0.5435	0.5508	0.5587	0.5643	0.5701	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			4.1400	1.0000	4.1400			(26)
TER Opening Type			10.9700	1.1450	12.5611			(27)
GF			47.0600	0.1300	6.1178			(28a)
Exposed Floor			2.7200	0.1300	0.3536			(28b)
Main	136.0800	15.1100	120.9700	0.1800	21.7746			(29a)
Dwarf Wall (PIRx0.72)	16.7700		16.7700	0.1800	3.0186			(29a)
PIJ	15.5100		15.5100	0.1100	1.7061			(30)
PIR	12.2300		12.2300	0.1100	1.3453			(30)
Residual Ceiling	26.3800		26.3800	0.1100	2.9018			(30)
Total net area of external elements Aum(A, m2)			256.7500					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	53.9189			(33)
Main dwelling								
Party Wall 1			40.6300	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	76.0412	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	10.6900	0.0500	0.5345
E3 Sill	10.6900	0.0500	0.5345
E4 Jamb	35.4000	0.0500	1.7700
E5 Ground floor (normal)	22.8600	0.1600	3.6576
E11 Eaves (insulation at rafter level)	18.1000	0.0400	0.7240
E16 Corner (normal)	29.0400	0.0900	2.6136
E12 Gable (insulation at ceiling level)	5.6600	0.0600	0.3396
E6 Intermediate floor within a dwelling	39.5500	0.0000	0.0000
E17 Corner (inverted - internal area greater than external area)	2.4800	-0.0900	-0.2232
P1 Party wall - Ground floor	6.2400	0.0800	0.4992
E20 Exposed floor (normal)	3.3800	0.3200	1.0816
E21 Exposed floor (inverted)	3.3800	0.3200	1.0816
E13 Gable (insulation at rafter level)	8.2800	0.0800	0.6624
E18 Party wall between dwellings	5.5600	0.0600	0.3336
R6 Flat ceiling	18.1000	0.0600	1.0860
E25 Staggered party wall between dwellings	4.9600	0.0600	0.2976

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	14.9926	(36)
Point Thermal bridges	(36a) = 0.0000	
Total fabric heat loss	(33) + (36) + (36a) = 68.9115	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	61.5060	61.1674	60.8355	59.2766	58.9849	57.6271	57.6271	57.3757	58.1501	58.9849	59.5749	60.1918	(38)
Heat transfer coeff	130.4175	130.0789	129.7470	128.1880	127.8964	126.5386	126.5386	126.2871	127.0616	127.8964	128.4864	129.1033	(39)
Average = Sum(39)m / 12 =												128.1866	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0846	1.0818	1.0791	1.0661	1.0637	1.0524	1.0524	1.0503	1.0567	1.0637	1.0686	1.0737	(40)
HLP (average)												1.0661	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.8642	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
72.2437	71.1580	69.5759	66.5490	64.3151	61.8240	60.4080	61.9781	63.6992	66.3739	69.4659	71.9669	(42a)

Hot water usage for baths

31.1904	30.7271	30.0748	28.8721	27.9715	26.9729	26.4334	27.0812	27.7865	28.8550	30.0826	31.0849	(42b)

Hot water usage for other uses

43.9627	42.3640	40.7654	39.1667	37.5681	35.9694	35.9694	37.5681	39.1667	40.7654	42.3640	43.9627	(42c)

Average daily hot water use (litres/day)	135.4907	(43)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use												
147.3967	144.2491	140.4161	134.5878	129.8547	124.7663	122.8109	126.6274	130.6524	135.9943	141.9125	147.0144	(44)
Energy conte 233.4403	205.4088	215.8143	184.2439	174.8094	153.4147	148.5292	156.7911	161.1075	184.5430	202.1803	230.1891	(45)
Energy content (annual)										Total = Sum(45)m =		2250.4717	
Distribution loss (46)m = 0.15 x (45)m													
35.0160	30.8113	32.3722	27.6366	26.2214	23.0122	22.2794	23.5187	24.1661	27.6815	30.3271	34.5284	(46)

Water storage loss:		
Store volume	210.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):	1.7016	(48)
Temperature factor from Table 2b	0.5400	(49)
Enter (49) or (54) in (55)	0.9188	(55)

Total storage loss

28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842	(56)

If cylinder contains dedicated solar storage

28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

285.1869	252.1477	267.5609	234.3213	226.5560	203.4920	200.2757	208.5377	211.1848	236.2896	252.2577	281.9357	(62)
WWHRS -33.0268	-29.2092	-30.5861	-25.3265	-23.6034	-20.1976	-18.9320	-20.1323	-20.8972	-24.6355	-27.9091	-32.4152	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

	252.1601	222.9385	236.9748	208.9947	202.9525	183.2944	181.3437	188.4054	190.2876	211.6541	224.3486	249.5205 (64)
										Total per year (kWh/year) = Sum(64)m =		2552.8750 (64)
12Total per year (kWh/year)												2553 (64)

Electric shower(s)

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000 (64a)

Heat gains from water heating, kWh/month

	119.0162	105.6895	113.1555	101.3230	99.5214	91.0723	90.7832	93.5303	93.6301	102.7578	107.2868	117.9351 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	169.4681	187.6254	169.4681	175.1171	169.4681	175.1171	169.4681	169.4681	175.1171	169.4681	175.1171	169.4681	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	285.5253	288.4881	281.0218	265.1269	245.0625	226.2048	213.6066	210.6438	218.1101	234.0050	254.0694	272.9272	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	(71)

Water heating gains (Table 5)

	159.9680	157.2761	152.0908	140.7264	133.7653	126.4893	122.0205	125.7128	130.0418	138.1154	149.0095	158.5150	(72)

Total internal gains

	683.9250	702.3532	671.5443	649.9339	617.2595	593.7747	571.0588	571.7883	589.2325	610.5520	647.1595	669.8738	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	5.8000	19.6403	0.6300	0.7000	0.7700	34.8135	(76)
South	2.3600	46.7521	0.6300	0.7000	0.7700	33.7198	(78)
West	2.8100	19.6403	0.6300	0.7000	0.7700	16.8665	(80)

Solar gains	85.3997	156.3213	236.8383	322.3254	380.4344	384.3624	367.9236	324.7780	267.1221	179.5247	104.4083	71.6361	(83)
Total gains	769.3247	858.6745	908.3826	972.2593	997.6939	978.1370	938.9824	896.5663	856.3547	790.0767	751.5678	741.5099	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	19.4742	19.5249	19.5748	19.8129	19.8581	20.0712	20.0712	20.1111	19.9885	19.8581	19.7669	19.6724	
alpha	2.2983	2.3017	2.3050	2.3209	2.3239	2.3381	2.3381	2.3407	2.3326	2.3239	2.3178	2.3115	
util living area	0.9389	0.9200	0.8939	0.8398	0.7579	0.6320	0.5068	0.5400	0.7081	0.8530	0.9174	0.9433	(86)
MIT	18.0371	18.3421	18.8184	19.4933	20.1103	20.6046	20.8331	20.8002	20.4433	19.6526	18.7533	17.9954	(87)
Th 2	20.0134	20.0157	20.0180	20.0286	20.0306	20.0399	20.0399	20.0416	20.0363	20.0306	20.0266	20.0224	(88)
util rest of house	0.9316	0.9105	0.8806	0.8183	0.7218	0.5710	0.4189	0.4543	0.6544	0.8290	0.9061	0.9366	(89)
MIT 2	16.5333	16.9190	17.5208	18.3680	19.1207	19.6961	19.9290	19.9023	19.5240	18.5785	17.4502	16.4851	(90)
Living area fraction									fLA = Living area / (4) =			0.2917	(91)
MIT	16.9720	17.3342	17.8994	18.6963	19.4094	19.9611	20.1927	20.1642	19.7922	18.8919	17.8303	16.9257	(92)
Temperature adjustment												0.0000	
adjusted MIT	16.9720	17.3342	17.8994	18.6963	19.4094	19.9611	20.1927	20.1642	19.7922	18.8919	17.8303	16.9257	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8997	0.8754	0.8433	0.7822	0.6950	0.5655	0.4339	0.4661	0.6389	0.7938	0.8713	0.9060	(94)
Useful gains	692.1970	751.6557	766.0180	760.5352	693.4127	553.0905	407.4087	417.8957	547.1630	627.1991	654.8764	671.8256	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1652.6547	1617.4261	1479.0344	1255.7716	986.0044	678.3892	454.6190	475.3744	723.2625	1060.4995	1378.7029	1642.9358	(97)
Space heating kWh	714.5806	581.7977	530.4842	356.5702	217.6882	0.0000	0.0000	0.0000	0.0000	322.3755	521.1551	722.5060	(98a)
Space heating requirement - total per year (kWh/year)												3967.1574	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	714.5806	581.7977	530.4842	356.5702	217.6882	0.0000	0.0000	0.0000	0.0000	322.3755	521.1551	722.5060	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3967.1574	
Space heating per m2											(98c) / (4) =	32.9937	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	714.5806	581.7977	530.4842	356.5702	217.6882	0.0000	0.0000	0.0000	0.0000	322.3755	521.1551	722.5060	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)

Space heating fuel (main heating system)

	774.1935	630.3334	574.7391	386.3166	235.8486	0.0000	0.0000	0.0000	0.0000	349.2692	564.6317	782.7800 (211)

Space heating efficiency (main heating system 2)

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)

Space heating fuel (main heating system 2)

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)

Space heating fuel (secondary)

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)

Water heating

Water heating requirement

	252.1601	222.9385	236.9748	208.9947	202.9525	183.2944	181.3437	188.4054	190.2876	211.6541	224.3486	249.5205 (64)

Efficiency of water heater

												79.8000 (216)
(217)m	86.2624	86.1096	85.8116	85.2472	84.2173	79.8000	79.8000	79.8000	79.8000	85.0005	85.8851	86.3015 (217)

Fuel for water heating, kWh/month

	292.3176	258.9010	276.1569	245.1632	240.9868	229.6923	227.2477	236.0970	238.4556	249.0032	261.2196	289.1266 (219)

Space cooling fuel requirement

(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	35.2121	28.2485	25.4346	18.6345	14.3938	11.7599	13.1305	17.0676	22.1691	29.0870	32.8537	36.1908 (232)

Electricity generated by PVs (Appendix M) (negative quantity)

(233a)m	-44.8072	-63.5497	-91.8382	-103.7677	-112.2423	-104.8160	-103.4928	-97.5518	-87.0985	-72.9046	-49.3875	-38.6916 (233a)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)

Electricity generated by PVs (Appendix M) (negative quantity)

(233b)m	-24.0979	-50.8552	-101.4085	-152.8048	-202.5583	-203.7721	-201.4037	-170.3034	-124.5108	-72.9191	-32.2313	-19.0454 (233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year

Space heating fuel - main system 1	4298.1120 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	79.8000
Water heating fuel used	3044.3677 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
Total electricity for the above, kWh/year	86.0000 (231)
Electricity for lighting (calculated in Appendix L)	284.1821 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-2326.0585 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	5386.6033 (238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	4298.1120	0.2100	902.6035	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3044.3677	0.2100	639.3172	(264)
Space and water heating			1541.9207	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	284.1821	0.1443	41.0163	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-970.1480	0.1345	-130.4743	
PV Unit electricity exported	-1355.9105	0.1258	-170.5666	
Total			-301.0408	(269)
Total CO2, kg/year			1293.8254	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.7600	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	4298.1120	1.1300	4856.8666	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3044.3677	1.1300	3440.1354	(278)
Space and water heating			8297.0020	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	284.1821	1.5338	435.8880	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-970.1480	1.4970	-1452.3538	
PV Unit electricity exported	-1355.9105	0.4617	-626.0894	
Total			-2078.4431	(283)
Total Primary energy kWh/year			6784.5477	(286)
Target Primary Energy Rate (TPER)			56.4300	(287)

Full SAP Calculation Printout

Property Reference	78449-04	**Issued on Date**	03/10/2025
Assessment Reference	001	**Prop Type Ref**	End
Property	848 Rochdale Road, MANCHESTER, M9 8FA		

SAP Rating	84 B	**DER**	3.33	**TER**	10.76
Environmental	97 A	**% DER < TER**			69.05
CO_2 Emissions (t/year)	0.38	**DFEE**	33.44	**TFEE**	38.50
Compliance Check	See BREL	**% DFEE < TFEE**			13.15
% DPER < TPER	37.58	**DPER**	35.22	**TPER**	56.43

Assessor Details	Mr. Daniel Goddard	**Assessor ID**	CP52-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.0600 (1b)	x	2.4800 (2b)	=	116.7088	(1b) - (3b)
First floor	49.7800 (1c)	x	2.7800 (2c)	=	138.3884	(1c) - (3c)
Second floor	23.4000 (1d)	x	2.7700 (2d)	=	64.8180	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	120.2400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	319.9152	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	4 * 10 =	40.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1250	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3750	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3188	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4064	0.3985	0.3905	0.3507	0.3427	0.3028	0.3028	0.2949	0.3188	0.3427	0.3586	0.3746	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5826	0.5794	0.5762	0.5615	0.5587	0.5459	0.5459	0.5435	0.5508	0.5587	0.5643	0.5701	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door			4.1400	1.0000	4.1400			(26)
Window			10.9700	0.7752	8.5039			(27)
GF			47.0600	0.0900	4.2354	75.0000	3529.5000	(28a)
Exposed Floor			2.7200	0.1400	0.3808	20.0000	54.4000	(28b)
Main	136.0800	15.1100	120.9700	0.1300	15.7261	9.0000	1088.7300	(29a)
Dwarf Wall (PIRx0.72)	16.7700		16.7700	0.0900	1.5093	9.0000	150.9300	(29a)
PIJ	15.5100		15.5100	0.1300	2.0163	9.0000	139.5900	(30)
PIR	12.2300		12.2300	0.1300	1.5899	9.0000	110.0700	(30)
Residual Ceiling	26.3800		26.3800	0.0900	2.3742	9.0000	237.4200	(30)
Total net area of external elements Aum(A, m2)			256.7500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		40.4759			(33)
Main dwelling								
Party Wall 1			40.6300	0.0000	0.0000	20.0000	812.6000	(32)
Timber			124.1700			9.0000	1117.5300	(32c)
FF			47.0600			18.0000	847.0800	(32d)
SF			23.4000			18.0000	421.2000	(32d)

GF	47.0600		9.0000	423.5400 (32e)
FF	23.4000		9.0000	210.6000 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 9143.1900 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 76.0412 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	10.6900	0.1150	1.2293
E3 Sill	10.6900	0.0170	0.1817
E4 Jamb	35.4000	0.0940	3.3276
E5 Ground floor (normal)	22.8600	0.0670	1.5316
E11 Eaves (insulation at rafter level)	18.1000	0.0250	0.4525
E16 Corner (normal)	29.0400	0.0680	1.9747
E12 Gable (insulation at ceiling level)	5.6600	0.0770	0.4358
E6 Intermediate floor within a dwelling	39.5500	0.0320	1.2656
E17 Corner (inverted - internal area greater than external area)	2.4800	-0.0290	-0.0719
P1 Party wall - Ground floor	6.2400	0.3200	1.9968
E20 Exposed floor (normal)	3.3800	0.0790	0.2670
E21 Exposed floor (inverted)	3.3800	0.0630	0.2129
E13 Gable (insulation at rafter level)	8.2800	0.0740	0.6127
E18 Party wall between dwellings	5.5600	0.0920	0.5115
R6 Flat ceiling	18.1000	-0.0430	-0.7783
E25 Staggered party wall between dwellings	4.9600	0.0560	0.2778

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 13.4275 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 53.9034 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	61.5060	61.1674	60.8355	59.2766	58.9849	57.6271	57.6271	57.3757	58.1501	58.9849	59.5749	60.1918	(38)
Heat transfer coeff	115.4094	115.0708	114.7388	113.1799	112.8882	111.5305	111.5305	111.2790	112.0535	112.8882	113.4783	114.0952	(39)
Average = Sum(39)m / 12 =												113.1785	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9598	0.9570	0.9542	0.9413	0.9389	0.9276	0.9276	0.9255	0.9319	0.9389	0.9438	0.9489	(40)
HLP (average)												0.9413	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.8642 (42)
Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

31.1904	30.7271	30.0748	28.8721	27.9715	26.9729	26.4334	27.0812	27.7865	28.8550	30.0826	31.0849	(42b)

Hot water usage for other uses

43.9627	42.3640	40.7654	39.1667	37.5681	35.9694	35.9694	37.5681	39.1667	40.7654	42.3640	43.9627	(42c)

Average daily hot water use (litres/day) 68.8844 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	75.1530	73.0911	70.8402	68.0388	65.5396	62.9423	62.4029	64.6493	66.9532	69.6204	72.4466	75.0476	(44)
Energy conte	119.0240	104.0808	108.8787	93.1417	88.2288	77.3949	75.4709	80.0493	82.5600	94.4742	103.2134	117.5064	(45)

Energy content (annual) Total = Sum(45)m = 1144.0232
Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss:
Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

101.1704	88.4687	92.5469	79.1705	74.9945	65.7857	64.1503	68.0419	70.1760	80.3031	87.7314	99.8804	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

101.1704	88.4687	92.5469	79.1705	74.9945	65.7857	64.1503	68.0419	70.1760	80.3031	87.7314	99.8804	(64)

Total per year (kWh/year) = Sum(64)m = 972.4197 (64)
12Total per year (kWh/year) 972 (64)
Electric shower(s)

57.8551	51.5494	56.2900	53.7168	54.7248	52.2022	53.9422	54.7248	53.7168	56.2900	55.2315	57.8551	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 658.0987 (64a)
Heat gains from water heating, kWh/month

39.7564	35.0045	37.2092	33.2218	32.4298	29.4970	29.5231	30.6917	30.9732	34.1483	35.7407	39.4339	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	173.9086	192.5416	173.9086	179.7055	173.9086	179.7055	173.9086	173.9086	179.7055	173.9086	179.7055	173.9086	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	285.5253	288.4881	281.0218	265.1269	245.0625	226.2048	213.6066	210.6438	218.1101	234.0050	254.0694	272.9272	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	(71)
Water heating gains (Table 5)	53.4360	52.0901	50.0124	46.1414	43.5885	40.9680	39.6816	41.2523	43.0183	45.8982	49.6399	53.0025	(72)
Total internal gains	578.8334	599.0834	570.9064	556.9374	528.5231	512.8418	493.1604	491.7682	506.7975	519.7753	549.3784	565.8018	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	5.8000	19.6403	0.3000	0.0000	0.7700	26.3140	(76)
South	2.3600	46.7521	0.3000	0.0000	0.7700	25.4874	(78)
West	2.8100	19.6403	0.3000	0.0000	0.7700	12.7487	(80)

Solar gains	64.5501	118.1567	179.0161	243.6322	287.5543	290.5234	278.0979	245.4860	201.9064	135.6952	78.9178	54.1467	(83)
Total gains	643.3835	717.2401	749.9225	800.5696	816.0775	803.3652	771.2583	737.2542	708.7039	655.4705	628.2962	619.9485	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	22.0067	22.0714	22.1353	22.4402	22.4981	22.7720	22.7720	22.8235	22.6657	22.4981	22.3812	22.2601	
alpha	2.4671	2.4714	2.4757	2.4960	2.4999	2.5181	2.5181	2.5216	2.5110	2.4999	2.4921	2.4840	
util living area	0.9545	0.9390	0.9185	0.8716	0.7975	0.6723	0.5432	0.5774	0.7456	0.8817	0.9368	0.9582	(86)
MIT	18.1808	18.4655	18.9019	19.5461	20.1354	20.6218	20.8436	20.8121	20.4680	19.7084	18.8622	18.1466	(87)
Th 2	20.1169	20.1193	20.1216	20.1326	20.1346	20.1441	20.1441	20.1459	20.1405	20.1346	20.1305	20.1261	(88)
util rest of house	0.9492	0.9319	0.9084	0.8543	0.7670	0.6173	0.4612	0.4980	0.6986	0.8626	0.9282	0.9533	(89)
MIT 2	17.5092	17.7917	18.2242	18.8613	19.4277	19.8776	20.0580	20.0376	19.7454	19.0276	18.1944	17.4813	(90)
Living area fraction										fLA = Living area / (4) =		0.2917	(91)
MIT	17.7051	17.9882	18.4219	19.0611	19.6342	20.0947	20.2872	20.2636	19.9562	19.2262	18.3892	17.6754	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.7051	17.9882	18.4219	19.0611	19.6342	20.0947	20.2872	20.2636	19.9562	19.2262	18.3892	17.6754	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9296	0.9094	0.8836	0.8287	0.7467	0.6139	0.4758	0.5098	0.6872	0.8379	0.9059	0.9347	(94)
Useful gains	598.0778	652.2353	662.6092	663.4077	609.3509	493.1472	366.9930	375.8318	486.9971	549.2384	569.1474	579.4830	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1547.0742	1506.0737	1367.9045	1150.0319	895.6745	612.8278	411.2341	429.9329	656.2072	973.7964	1281.0847	1537.4757	(97)
Space heating kWh	706.0533	573.7794	524.7398	350.3694	213.0248	0.0000	0.0000	0.0000	0.0000	315.8712	512.5949	712.7466	(98a)
Space heating requirement - total per year (kWh/year)												3909.1793	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	706.0533	573.7794	524.7398	350.3694	213.0248	0.0000	0.0000	0.0000	0.0000	315.8712	512.5949	712.7466	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3909.1793	
Space heating per m2											(98c) / (4) =	32.5115	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	1048.3863	825.3254	845.7205	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.6355	0.7101	0.6847	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	666.2432	586.0248	579.1039	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	845.7105	812.3232	776.2837	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	129.2165	168.3660	146.7018	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	32.3041	42.0915	36.6754	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												111.0711	(107)
Energy for space heating												32.5115	(99)
Energy for space cooling												0.9237	(108)
Total												33.4352	(109)
Fabric Energy Efficiency (DFEE)												33.4	(109)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.0600 (1b)	x	2.4800 (2b)	=	116.7088	(1b) - (3b)
First floor	49.7800 (1c)	x	2.7800 (2c)	=	138.3884	(1c) - (3c)
Second floor	23.4000 (1d)	x	2.7700 (2d)	=	64.8180	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	120.2400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	319.9152	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	4 * 10 =	40.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1250	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3750	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3188	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4064	0.3985	0.3905	0.3507	0.3427	0.3028	0.3028	0.2949	0.3188	0.3427	0.3586	0.3746	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0.0000	(23c)
Effective ac	0.5701	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			4.1400	1.0000	4.1400			(26)
TER Opening Type			10.9700	1.1450	12.5611			(27)
GF			47.0600	0.1300	6.1178			(28a)
Exposed Floor			2.7200	0.1300	0.3536			(28b)
Main	136.0800	15.1100	120.9700	0.1800	21.7746			(29a)
Dwarf Wall (PIRx0.72)	16.7700		16.7700	0.1800	3.0186			(29a)
PIJ	15.5100		15.5100	0.1100	1.7061			(30)
PIR	12.2300		12.2300	0.1100	1.3453			(30)
Residual Ceiling	26.3800		26.3800	0.1100	2.9018			(30)
Total net area of external elements Aum(A, m2)			256.7500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		53.9189			(33)
Main dwelling								
Party Wall 1			40.6300	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	76.0412	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	10.6900	0.0500	0.5345
E3 Sill	10.6900	0.0500	0.5345
E4 Jamb	35.4000	0.0500	1.7700
E5 Ground floor (normal)	22.8600	0.1600	3.6576
E11 Eaves (insulation at rafter level)	18.1000	0.0400	0.7240
E16 Corner (normal)	29.0400	0.0900	2.6136
E12 Gable (insulation at ceiling level)	5.6600	0.0600	0.3396
E6 Intermediate floor within a dwelling	39.5500	0.0000	0.0000
E17 Corner (inverted - internal area greater than external area)	2.4800	-0.0900	-0.2232
P1 Party wall - Ground floor	6.2400	0.0800	0.4992
E20 Exposed floor (normal)	3.3800	0.3200	1.0816
E21 Exposed floor (inverted)	3.3800	0.3200	1.0816
E13 Gable (insulation at rafter level)	8.2800	0.0800	0.6624
E18 Party wall between dwellings	5.5600	0.0600	0.3336
R6 Flat ceiling	18.1000	0.0600	1.0860
E25 Staggered party wall between dwellings	4.9600	0.0600	0.2976

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		14.9926	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	68.9115	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	61.5060	61.1674	60.8355	59.2766	58.9849	57.6271	57.6271	57.3757	58.1501	58.9849	59.5749	60.1918	(38)
Heat transfer coeff	130.4175	130.0789	129.7470	128.1880	127.8964	126.5386	126.5386	126.2871	127.0616	127.8964	128.4864	129.1033	(39)
Average = Sum(39)m / 12 =												128.1866	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0846	1.0818	1.0791	1.0661	1.0637	1.0524	1.0524	1.0503	1.0567	1.0637	1.0686	1.0737	(40)
HLP (average)												1.0661	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.8642	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

31.1904	30.7271	30.0748	28.8721	27.9715	26.9729	26.4334	27.0812	27.7865	28.8550	30.0826	31.0849	(42b)

Hot water usage for other uses

43.9627	42.3640	40.7654	39.1667	37.5681	35.9694	35.9694	37.5681	39.1667	40.7654	42.3640	43.9627	(42c)

Average daily hot water use (litres/day)	68.8844 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	75.1530	73.0911	70.8402	68.0388	65.5396	62.9423	62.4029	64.6493	66.9532	69.6204	72.4466	75.0476	(44)
Energy conte	119.0240	104.0808	108.8787	93.1417	88.2288	77.3949	75.4709	80.0493	82.5600	94.4742	103.2134	117.5064	(45)

Energy content (annual) Total = Sum(45)m = 1144.0232
Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss:
Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

101.1704	88.4687	92.5469	79.1705	74.9945	65.7857	64.1503	68.0419	70.1760	80.3031	87.7314	99.8804	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

101.1704	88.4687	92.5469	79.1705	74.9945	65.7857	64.1503	68.0419	70.1760	80.3031	87.7314	99.8804	(64)

Total per year (kWh/year) = Sum(64)m = 972.4197 (64)
12Total per year (kWh/year) 972 (64)
Electric shower(s)

57.8551	51.5494	56.2900	53.7168	54.7248	52.2022	53.9422	54.7248	53.7168	56.2900	55.2315	57.8551	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 658.0987 (64a)
Heat gains from water heating, kWh/month

39.7564	35.0045	37.2092	33.2218	32.4298	29.4970	29.5231	30.6917	30.9732	34.1483	35.7407	39.4339	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

169.4681	187.6254	169.4681	175.1171	169.4681	175.1171	169.4681	169.4681	175.1171	169.4681	175.1171	169.4681	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

285.5253	288.4881	281.0218	265.1269	245.0625	226.2048	213.6066	210.6438	218.1101	234.0050	254.0694	272.9272	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	(71)

Water heating gains (Table 5)

53.4360	52.0901	50.0124	46.1414	43.5885	40.9680	39.6816	41.2523	43.0183	45.8982	49.6399	53.0025	(72)

Total internal gains

574.3930	594.1672	566.4659	552.3490	524.0827	508.2534	488.7199	487.3277	502.2091	515.3349	544.7899	561.3614	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	5.8000	19.6403	0.6300	0.7000	0.7700	34.8135	(76)
South	2.3600	46.7521	0.6300	0.7000	0.7700	33.7198	(78)
West	2.8100	19.6403	0.6300	0.7000	0.7700	16.8665	(80)

Solar gains	85.3997	156.3213	236.8383	322.3254	380.4344	384.3624	367.9236	324.7780	267.1221	179.5247	104.4083	71.6361	(83)
Total gains	659.7927	750.4885	803.3042	874.6744	904.5171	892.6158	856.6435	812.1057	769.3312	694.8596	649.1982	632.9975	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	19.4742	19.5249	19.5748	19.8129	19.8581	20.0712	20.0712	20.1111	19.9885	19.8581	19.7669	19.6724	
alpha	2.2983	2.3017	2.3050	2.3209	2.3239	2.3381	2.3381	2.3407	2.3326	2.3239	2.3178	2.3115	
util living area	0.9543	0.9374	0.9143	0.8644	0.7879	0.6657	0.5410	0.5773	0.7442	0.8806	0.9368	0.9582	(86)
MIT	17.8485	18.1660	18.6602	19.3692	20.0210	20.5551	20.8075	20.7685	20.3736	19.5252	18.5866	17.8054	(87)
Th 2	20.0134	20.0157	20.0180	20.0286	20.0306	20.0399	20.0399	20.0416	20.0363	20.0306	20.0266	20.0224	(88)
util rest of house	0.9487	0.9297	0.9031	0.8452	0.7540	0.6054	0.4508	0.4900	0.6930	0.8599	0.9278	0.9530	(89)
MIT 2	17.1162	17.4308	17.9197	18.6188	19.2434	19.7347	19.9386	19.9137	19.5809	18.7809	17.8574	17.0791	(90)
Living area fraction										fLA = Living area / (4) =		0.2917	(91)
MIT	17.3299	17.6453	18.1358	18.8378	19.4702	19.9740	20.1921	20.1631	19.8122	18.9981	18.0702	17.2910	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.3299	17.6453	18.1358	18.8378	19.4702	19.9740	20.1921	20.1631	19.8122	18.9981	18.0702	17.2910	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9272	0.9047	0.8752	0.8164	0.7313	0.6009	0.4662	0.5020	0.6793	0.8322	0.9032	0.9328	(94)
Useful gains	611.7881	678.9951	703.0556	714.0500	661.4817	536.3310	399.4080	407.7177	522.6036	578.2778	586.3317	590.4503	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1699.3253	1657.8908	1509.7040	1273.9019	993.7831	680.0242	454.5408	475.2287	725.7985	1074.0846	1409.5189	1690.0912	(97)
Space heating kWh	809.1277	657.8179	600.1464	403.0933	247.2322	0.0000	0.0000	0.0000	0.0000	368.8803	592.6948	818.1329	(98a)

Space heating requirement - total per year (kWh/year) 4497.1255
Solar heating kWh

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)

Solar heating contribution - total per year (kWh/year) 0.0000
Space heating kWh

809.1277	657.8179	600.1464	403.0933	247.2322	0.0000	0.0000	0.0000	0.0000	368.8803	592.6948	818.1329	(98c)

Space heating requirement after solar contribution - total per year (kWh/year) 4497.1255
Space heating per m2 (98c) / (4) = 37.4012 (99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	1189.4625	936.3854	959.7822	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.6205	0.6930	0.6649	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	738.1124	648.9392	638.1660	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	955.0040	916.8944	868.4170	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	156.1619	199.3587	171.3067	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	39.0405	49.8397	42.8267	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												131.7068	(107)
Energy for space heating												37.4012	(99)
Energy for space cooling												1.0954	(108)
Total												38.4966	(109)
Fabric Energy Efficiency (TFEE)												38.5	(109)

Full SAP Calculation Printout

Property Reference	78449-04	**Issued on Date**	03/10/2025
Assessment Reference	001	**Prop Type Ref**	End
Property	848 Rochdale Road, MANCHESTER, M9 8FA		

SAP Rating	84 B	**DER**	3.33	**TER**	10.76
Environmental	97 A	**% DER < TER**			69.05
CO_2 Emissions (t/year)	0.38	**DFEE**	33.44	**TFEE**	38.50
Compliance Check	See BREL	**% DFEE < TFEE**			13.15
% DPER < TPER	37.58	**DPER**	35.22	**TPER**	56.43

Assessor Details	Mr. Daniel Goddard	**Assessor ID**	CP52-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.0600 (1b)	x	2.4800 (2b)	=	116.7088	(1b) - (3b)
First floor	49.7800 (1c)	x	2.7800 (2c)	=	138.3884	(1c) - (3c)
Second floor	23.4000 (1d)	x	2.7700 (2d)	=	64.8180	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	120.2400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	319.9152	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.2500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2125	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2709	0.2656	0.2603	0.2338	0.2284	0.2019	0.2019	0.1966	0.2125	0.2284	0.2391	0.2497	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	80.1000 (23c)

Effective ac	0.3704	0.3651	0.3598	0.3332	0.3279	0.3014	0.3014	0.2961	0.3120	0.3279	0.3386	0.3492	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door			4.1400	1.0000	4.1400			(26)
Window			10.9700	0.7752	8.5039			(27)
GF			47.0600	0.0900	4.2354	75.0000	3529.5000	(28a)
Exposed Floor			2.7200	0.1400	0.3808	20.0000	54.4000	(28b)
Main	136.0800	15.1100	120.9700	0.1300	15.7261	9.0000	1088.7300	(29a)
Dwarf Wall (PIRx0.72)	16.7700		16.7700	0.0900	1.5093	9.0000	150.9300	(29a)
PIJ	15.5100		15.5100	0.1300	2.0163	9.0000	139.5900	(30)
PIR	12.2300		12.2300	0.1300	1.5899	9.0000	110.0700	(30)
Residual Ceiling	26.3800		26.3800	0.0900	2.3742	9.0000	237.4200	(30)
Total net area of external elements Aum(A, m2)			256.7500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		40.4759			(33)
Main dwelling								
Party Wall 1			40.6300	0.0000	0.0000	20.0000	812.6000	(32)

Timber	124.1700		9.0000	1117.5300 (32c)
FF	47.0600		18.0000	847.0800 (32d)
SF	23.4000		18.0000	421.2000 (32d)
GF	47.0600		9.0000	423.5400 (32e)
FF	23.4000		9.0000	210.6000 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 9143.1900 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 76.0412 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	10.6900	0.1150	1.2293
E3 Sill	10.6900	0.0170	0.1817
E4 Jamb	35.4000	0.0940	3.3276
E5 Ground floor (normal)	22.8600	0.0670	1.5316
E11 Eaves (insulation at rafter level)	18.1000	0.0250	0.4525
E16 Corner (normal)	29.0400	0.0680	1.9747
E12 Gable (insulation at ceiling level)	5.6600	0.0770	0.4358
E6 Intermediate floor within a dwelling	39.5500	0.0320	1.2656
E17 Corner (inverted - internal area greater than external area)	2.4800	-0.0290	-0.0719
P1 Party wall - Ground floor	6.2400	0.3200	1.9968
E20 Exposed floor (normal)	3.3800	0.0790	0.2670
E21 Exposed floor (inverted)	3.3800	0.0630	0.2129
E13 Gable (insulation at rafter level)	8.2800	0.0740	0.6127
E18 Party wall between dwellings	5.5600	0.0920	0.5115
R6 Flat ceiling	18.1000	-0.0430	-0.7783
E25 Staggered party wall between dwellings	4.9600	0.0560	0.2778

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 13.4275 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 53.9034 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	39.1078	38.5470	37.9861	35.1819	34.6210	31.8168	31.8168	31.2559	32.9385	34.6210	35.7427	36.8644	(38)
Heat transfer coeff	93.0112	92.4503	91.8895	89.0852	88.5244	85.7201	85.7201	85.1593	86.8418	88.5244	89.6461	90.7678	(39)

Average = Sum(39)m / 12 = 88.9450

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7735	0.7689	0.7642	0.7409	0.7362	0.7129	0.7129	0.7082	0.7222	0.7362	0.7456	0.7549	(40)
HLP (average)												0.7397	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.8642 (42)
Hot water usage for mixer showers

72.2437	71.1580	69.5759	66.5490	64.3151	61.8240	60.4080	61.9781	63.6992	66.3739	69.4659	71.9669	(42a)

Hot water usage for baths

31.1904	30.7271	30.0748	28.8721	27.9715	26.9729	26.4334	27.0812	27.7865	28.8550	30.0826	31.0849	(42b)

Hot water usage for other uses

43.9627	42.3640	40.7654	39.1667	37.5681	35.9694	35.9694	37.5681	39.1667	40.7654	42.3640	43.9627	(42c)

Average daily hot water use (litres/day) 135.4907 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	147.3967	144.2491	140.4161	134.5878	129.8547	124.7663	122.8109	126.6274	130.6524	135.9943	141.9125	147.0144	(44)
Energy conte	233.4403	205.4088	215.8143	184.2439	174.8094	153.4147	148.5292	156.7911	161.1075	184.5430	202.1803	230.1891	(45)
Energy content (annual)										Total = Sum(45)m =		2250.4717	
Distribution loss (46)m = 0.15 x (45)m	35.0160	30.8113	32.3722	27.6366	26.2214	23.0122	22.2794	23.5187	24.1661	27.6815	30.3271	34.5284	(46)
Water storage loss:													
Store volume												210.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5800	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8532	(55)
Total storage loss	26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(56)
If cylinder contains dedicated solar storage	26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	283.1519	250.3096	265.5259	232.3519	224.5210	201.5227	198.2408	206.5027	209.2155	234.2546	250.2883	279.9007	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	283.1519	250.3096	265.5259	232.3519	224.5210	201.5227	198.2408	206.5027	209.2155	234.2546	250.2883	279.9007	(64)
										Total per year (kWh/year) = Sum(64)m =		2835.7857	(64)
12Total per year (kWh/year)												2836	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	117.3882	104.2191	111.5276	99.7475	97.8934	89.4968	89.1552	91.9023	92.0546	101.1298	105.7114	116.3071	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	173.9086	192.5416	173.9086	179.7055	173.9086	179.7055	173.9086	173.9086	179.7055	173.9086	179.7055	173.9086	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	285.5253	288.4881	281.0218	265.1269	245.0625	226.2048	213.6066	210.6438	218.1101	234.0050	254.0694	272.9272	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	(71)
Water heating gains (Table 5)	157.7798	155.0879	149.9026	138.5382	131.5771	124.3011	119.8323	123.5246	127.8537	135.9272	146.8213	156.3268	(72)
Total internal gains	683.1772	702.0812	670.7966	649.3342	616.5118	596.1749	573.3110	574.0405	591.6328	609.8043	646.5598	669.1261	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	5.8000	19.6403	0.3000	0.0000	0.7700	26.3140	(76)
South	2.3600	46.7521	0.3000	0.0000	0.7700	25.4874	(78)
West	2.8100	19.6403	0.3000	0.0000	0.7700	12.7487	(80)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	64.5501	118.1567	179.0161	243.6322	287.5543	290.5234	278.0979	245.4860	201.9064	135.6952	78.9178	54.1467	(83)
Total gains	747.7273	820.2379	849.8127	892.9664	904.0661	886.6983	851.4090	819.5266	793.5392	745.4994	725.4776	723.2728	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	27.3061	27.4718	27.6395	28.5095	28.6901	29.6287	29.6287	29.8238	29.2460	28.6901	28.3311	27.9810	
alpha	2.8204	2.8315	2.8426	2.9006	2.9127	2.9752	2.9752	2.9883	2.9497	2.9127	2.8887	2.8654	
util living area	0.9297	0.9075	0.8773	0.8089	0.7086	0.5523	0.4202	0.4490	0.6346	0.8169	0.9003	0.9343	(86)
Living	18.9939	19.2566	19.6220	20.1555	20.5653	20.8583	20.9533	20.9426	20.7709	20.2583	19.5950	18.9970	
Non living	18.4155	18.6757	19.0363	19.5662	19.9536	20.2289	20.3028	20.2996	20.1510	19.6734	19.0255	18.4301	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	19.9738	19.2566	19.6220	20.1555	20.5653	20.8583	20.9533	20.9426	20.7709	20.2583	19.5950	19.2772	(87)
Th 2	20.2763	20.2804	20.2845	20.3048	20.3089	20.3294	20.3294	20.3336	20.3212	20.3089	20.3008	20.2926	(88)
util rest of house	0.9228	0.8986	0.8651	0.7895	0.6779	0.5068	0.3625	0.3916	0.5913	0.7947	0.8894	0.9279	(89)
MIT 2	19.3244	18.6757	19.0363	19.5662	19.9536	20.2289	20.3028	20.2996	20.1510	19.6734	19.0255	18.6906	(90)
Living area fraction										fLA = Living area / (4) =		0.2917	(91)
MIT	19.5138	18.8451	19.2072	19.7381	20.1321	20.4125	20.4926	20.4872	20.3318	19.8440	19.1917	18.8617	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5138	18.8451	19.2072	19.7381	20.1321	20.4125	20.4926	20.4872	20.3318	19.8440	19.1917	18.8617	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9145	0.8772	0.8435	0.7719	0.6694	0.5126	0.3769	0.4052	0.5920	0.7780	0.8688	0.9121	(94)
Useful gains	683.7978	719.4962	716.8464	689.2955	605.2247	454.5457	320.8652	332.0421	469.7881	580.0068	630.2904	659.7148	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1415.0565	1289.2330	1167.6571	965.5185	746.4449	498.2492	333.6747	348.0640	541.1839	818.3223	1083.9702	1330.8134	(97)
Space heating kWh	544.0565	382.8631	335.4032	198.8806	105.0678	0.0000	0.0000	0.0000	0.0000	177.3067	326.6495	499.2973	(98a)
Space heating requirement - total per year (kWh/year)												2569.5247	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	544.0565	382.8631	335.4032	198.8806	105.0678	0.0000	0.0000	0.0000	0.0000	177.3067	326.6495	499.2973	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2569.5247	
Space heating per m2											(98c) / (4) =	21.3700	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Efficiency of main space heating system 1 (in %)	281.3941 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	544.0565	382.8631	335.4032	198.8806	105.0678	0.0000	0.0000	0.0000	0.0000	177.3067	326.6495	499.2973	(98)
Space heating efficiency (main heating system 1)	281.3941	281.3941	281.3941	281.3941	281.3941	0.0000	0.0000	0.0000	0.0000	281.3941	281.3941	281.3941	(210)
Space heating fuel (main heating system)	193.3433	136.0594	119.1934	70.6769	37.3383	0.0000	0.0000	0.0000	0.0000	63.0101	116.0826	177.4370	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	283.1519	250.3096	265.5259	232.3519	224.5210	201.5227	198.2408	206.5027	209.2155	234.2546	250.2883	279.9007	(64)
Efficiency of water heater												279.7109	(216)
(217)m	279.7109	279.7109	279.7109	279.7109	279.7109	279.7109	279.7109	279.7109	279.7109	279.7109	279.7109	279.7109	(217)
Fuel for water heating, kWh/month	101.2302	89.4887	94.9287	83.0686	80.2689	72.0468	70.8734	73.8272	74.7970	83.7488	89.4811	100.0678	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	45.0156	40.6593	45.0156	43.5635	45.0156	43.5635	45.0156	45.0156	43.5635	45.0156	43.5635	45.0156	(231)
Lighting	36.6415	29.3952	26.4671	19.3909	14.9781	12.2373	13.6635	17.7604	23.0690	30.2678	34.1874	37.6599	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)

Electricity generated by PVs (Appendix M) (negative quantity)

(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year		
Space heating fuel - main system 1	913.1410	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	279.7109	
Water heating fuel used	1013.8274	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.3580)		
mechanical ventilation fans (SFP = 1.3580)	530.0227	(230a)
Total electricity for the above, kWh/year	530.0227	(231)
Electricity for lighting (calculated in Appendix L)	295.7182	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2752.7093	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	913.1410	0.1550	141.5766	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1013.8274	0.1410	142.9361	(264)
Space and water heating			284.5127	(265)
Pumps, fans and electric keep-hot	530.0227	0.1387	73.5207	(267)
Energy for lighting	295.7182	0.1443	42.6813	(268)
Total CO2, kg/year			400.7146	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.3300	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	913.1410	1.5740	1437.2644	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1013.8274	1.5213	1542.3577	(278)
Space and water heating			2979.6221	(279)
Pumps, fans and electric keep-hot	530.0227	1.5128	801.8183	(281)
Energy for lighting	295.7182	1.5338	453.5824	(282)
Total Primary energy kWh/year			4235.0228	(286)
Dwelling Primary energy Rate (DPER)			35.2200	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.0600 (1b)	x	2.4800 (2b)	=	116.7088	(1b) - (3b)
First floor	49.7800 (1c)	x	2.7800 (2c)	=	138.3884	(1c) - (3c)
Second floor	23.4000 (1d)	x	2.7700 (2d)	=	64.8180	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	120.2400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	319.9152	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	4 * 10 =	40.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1250	(8)
Pressure test		Yes	

Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.3750	(18)
Number of sides sheltered	2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3188	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4064	0.3985	0.3905	0.3507	0.3427	0.3028	0.3028	0.2949	0.3188	0.3427	0.3586	0.3746	(22b)
Effective ac	0.5826	0.5794	0.5762	0.5615	0.5587	0.5459	0.5459	0.5435	0.5508	0.5587	0.5643	0.5701	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			4.1400	1.0000	4.1400			(26)
TER Opening Type			10.9700	1.1450	12.5611			(27)
GF			47.0600	0.1300	6.1178			(28a)
Exposed Floor			2.7200	0.1300	0.3536			(28b)
Main	136.0800	15.1100	120.9700	0.1800	21.7746			(29a)
Dwarf Wall (PIRx0.72)	16.7700		16.7700	0.1800	3.0186			(29a)
PIJ	15.5100		15.5100	0.1100	1.7061			(30)
PIR	12.2300		12.2300	0.1100	1.3453			(30)
Residual Ceiling	26.3800		26.3800	0.1100	2.9018			(30)
Total net area of external elements Aum(A, m2)			256.7500					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	53.9189			(33)
Main dwelling								
Party Wall 1			40.6300	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	76.0412	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	10.6900	0.0500	0.5345
E3 Sill	10.6900	0.0500	0.5345
E4 Jamb	35.4000	0.0500	1.7700
E5 Ground floor (normal)	22.8600	0.1600	3.6576
E11 Eaves (insulation at rafter level)	18.1000	0.0400	0.7240
E16 Corner (normal)	29.0400	0.0900	2.6136
E12 Gable (insulation at ceiling level)	5.6600	0.0600	0.3396
E6 Intermediate floor within a dwelling	39.5500	0.0000	0.0000
E17 Corner (inverted - internal area greater than external area)	2.4800	-0.0900	-0.2232
P1 Party wall - Ground floor	6.2400	0.0800	0.4992
E20 Exposed floor (normal)	3.3800	0.3200	1.0816
E21 Exposed floor (inverted)	3.3800	0.3200	1.0816
E13 Gable (insulation at rafter level)	8.2800	0.0800	0.6624
E18 Party wall between dwellings	5.5600	0.0600	0.3336
R6 Flat ceiling	18.1000	0.0600	1.0860
E25 Staggered party wall between dwellings	4.9600	0.0600	0.2976

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	14.9926	(36)
Point Thermal bridges	(36a) = 0.0000	
Total fabric heat loss	(33) + (36) + (36a) = 68.9115	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	61.5060	61.1674	60.8355	59.2766	58.9849	57.6271	57.6271	57.3757	58.1501	58.9849	59.5749	60.1918	(38)
Heat transfer coeff	130.4175	130.0789	129.7470	128.1880	127.8964	126.5386	126.5386	126.2871	127.0616	127.8964	128.4864	129.1033	(39)
Average = Sum(39)m / 12 =												128.1866	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0846	1.0818	1.0791	1.0661	1.0637	1.0524	1.0524	1.0503	1.0567	1.0637	1.0686	1.0737	(40)
HLP (average)												1.0661	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.8642	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
72.2437	71.1580	69.5759	66.5490	64.3151	61.8240	60.4080	61.9781	63.6992	66.3739	69.4659	71.9669	(42a)

Hot water usage for baths

31.1904	30.7271	30.0748	28.8721	27.9715	26.9729	26.4334	27.0812	27.7865	28.8550	30.0826	31.0849	(42b)

Hot water usage for other uses

43.9627	42.3640	40.7654	39.1667	37.5681	35.9694	35.9694	37.5681	39.1667	40.7654	42.3640	43.9627	(42c)

Average daily hot water use (litres/day)	135.4907	(43)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use												
147.3967	144.2491	140.4161	134.5878	129.8547	124.7663	122.8109	126.6274	130.6524	135.9943	141.9125	147.0144	(44)
Energy conte 233.4403	205.4088	215.8143	184.2439	174.8094	153.4147	148.5292	156.7911	161.1075	184.5430	202.1803	230.1891	(45)
Energy content (annual)										Total = Sum(45)m =		2250.4717	
Distribution loss (46)m = 0.15 x (45)m													
35.0160	30.8113	32.3722	27.6366	26.2214	23.0122	22.2794	23.5187	24.1661	27.6815	30.3271	34.5284	(46)

Water storage loss:		
Store volume	210.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):	1.7016	(48)
Temperature factor from Table 2b	0.5400	(49)
Enter (49) or (54) in (55)	0.9188	(55)

Total storage loss

28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842	(56)

If cylinder contains dedicated solar storage

28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

285.1869	252.1477	267.5609	234.3213	226.5560	203.4920	200.2757	208.5377	211.1848	236.2896	252.2577	281.9357	(62)
WWHRS -33.0268	-29.2092	-30.5861	-25.3265	-23.6034	-20.1976	-18.9320	-20.1323	-20.8972	-24.6355	-27.9091	-32.4152	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

	252.1601	222.9385	236.9748	208.9947	202.9525	183.2944	181.3437	188.4054	190.2876	211.6541	224.3486	249.5205 (64)
										Total per year (kWh/year) = Sum(64)m =		2552.8750 (64)
12Total per year (kWh/year)												2553 (64)

Electric shower(s)

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000 (64a)

Heat gains from water heating, kWh/month

	119.0162	105.6895	113.1555	101.3230	99.5214	91.0723	90.7832	93.5303	93.6301	102.7578	107.2868	117.9351 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	169.4681	187.6254	169.4681	175.1171	169.4681	175.1171	169.4681	169.4681	175.1171	169.4681	175.1171	169.4681	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	285.5253	288.4881	281.0218	265.1269	245.0625	226.2048	213.6066	210.6438	218.1101	234.0050	254.0694	272.9272	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	(71)

Water heating gains (Table 5)

	159.9680	157.2761	152.0908	140.7264	133.7653	126.4893	122.0205	125.7128	130.0418	138.1154	149.0095	158.5150	(72)

Total internal gains

	683.9250	702.3532	671.5443	649.9339	617.2595	593.7747	571.0588	571.7883	589.2325	610.5520	647.1595	669.8738	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	5.8000	19.6403	0.6300	0.7000	0.7700	34.8135	(76)
South	2.3600	46.7521	0.6300	0.7000	0.7700	33.7198	(78)
West	2.8100	19.6403	0.6300	0.7000	0.7700	16.8665	(80)

Solar gains	85.3997	156.3213	236.8383	322.3254	380.4344	384.3624	367.9236	324.7780	267.1221	179.5247	104.4083	71.6361	(83)
Total gains	769.3247	858.6745	908.3826	972.2593	997.6939	978.1370	938.9824	896.5663	856.3547	790.0767	751.5678	741.5099	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	19.4742	19.5249	19.5748	19.8129	19.8581	20.0712	20.0712	20.1111	19.9885	19.8581	19.7669	19.6724	
alpha	2.2983	2.3017	2.3050	2.3209	2.3239	2.3381	2.3381	2.3407	2.3326	2.3239	2.3178	2.3115	
util living area	0.9389	0.9200	0.8939	0.8398	0.7579	0.6320	0.5068	0.5400	0.7081	0.8530	0.9174	0.9433	(86)
MIT	18.0371	18.3421	18.8184	19.4933	20.1103	20.6046	20.8331	20.8002	20.4433	19.6526	18.7533	17.9954	(87)
Th 2	20.0134	20.0157	20.0180	20.0286	20.0306	20.0399	20.0399	20.0416	20.0363	20.0306	20.0266	20.0224	(88)
util rest of house	0.9316	0.9105	0.8806	0.8183	0.7218	0.5710	0.4189	0.4543	0.6544	0.8290	0.9061	0.9366	(89)
MIT 2	16.5333	16.9190	17.5208	18.3680	19.1207	19.6961	19.9290	19.9023	19.5240	18.5785	17.4502	16.4851	(90)
Living area fraction									fLA = Living area / (4) =			0.2917	(91)
MIT	16.9720	17.3342	17.8994	18.6963	19.4094	19.9611	20.1927	20.1642	19.7922	18.8919	17.8303	16.9257	(92)
Temperature adjustment												0.0000	
adjusted MIT	16.9720	17.3342	17.8994	18.6963	19.4094	19.9611	20.1927	20.1642	19.7922	18.8919	17.8303	16.9257	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8997	0.8754	0.8433	0.7822	0.6950	0.5655	0.4339	0.4661	0.6389	0.7938	0.8713	0.9060	(94)
Useful gains	692.1970	751.6557	766.0180	760.5352	693.4127	553.0905	407.4087	417.8957	547.1630	627.1991	654.8764	671.8256	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1652.6547	1617.4261	1479.0344	1255.7716	986.0044	678.3892	454.6190	475.3744	723.2625	1060.4995	1378.7029	1642.9358	(97)
Space heating kWh	714.5806	581.7977	530.4842	356.5702	217.6882	0.0000	0.0000	0.0000	0.0000	322.3755	521.1551	722.5060	(98a)
Space heating requirement - total per year (kWh/year)												3967.1574	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	714.5806	581.7977	530.4842	356.5702	217.6882	0.0000	0.0000	0.0000	0.0000	322.3755	521.1551	722.5060	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3967.1574	
Space heating per m2											(98c) / (4) =	32.9937	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	714.5806	581.7977	530.4842	356.5702	217.6882	0.0000	0.0000	0.0000	0.0000	322.3755	521.1551	722.5060	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)

Space heating fuel (main heating system)

	774.1935	630.3334	574.7391	386.3166	235.8486	0.0000	0.0000	0.0000	0.0000	349.2692	564.6317	782.7800 (211)

Space heating efficiency (main heating system 2)

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)

Space heating fuel (main heating system 2)

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)

Space heating fuel (secondary)

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)

Water heating

Water heating requirement

	252.1601	222.9385	236.9748	208.9947	202.9525	183.2944	181.3437	188.4054	190.2876	211.6541	224.3486	249.5205 (64)

Efficiency of water heater

												79.8000 (216)
(217)m	86.2624	86.1096	85.8116	85.2472	84.2173	79.8000	79.8000	79.8000	79.8000	85.0005	85.8851	86.3015 (217)

Fuel for water heating, kWh/month

	292.3176	258.9010	276.1569	245.1632	240.9868	229.6923	227.2477	236.0970	238.4556	249.0032	261.2196	289.1266 (219)

Space cooling fuel requirement

(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	35.2121	28.2485	25.4346	18.6345	14.3938	11.7599	13.1305	17.0676	22.1691	29.0870	32.8537	36.1908 (232)

Electricity generated by PVs (Appendix M) (negative quantity)

(233a)m	-44.8072	-63.5497	-91.8382	-103.7677	-112.2423	-104.8160	-103.4928	-97.5518	-87.0985	-72.9046	-49.3875	-38.6916 (233a)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)

Electricity generated by PVs (Appendix M) (negative quantity)

(233b)m	-24.0979	-50.8552	-101.4085	-152.8048	-202.5583	-203.7721	-201.4037	-170.3034	-124.5108	-72.9191	-32.2313	-19.0454 (233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year

Space heating fuel - main system 1	4298.1120 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	79.8000
Water heating fuel used	3044.3677 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
Total electricity for the above, kWh/year	86.0000 (231)
Electricity for lighting (calculated in Appendix L)	284.1821 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-2326.0585 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	5386.6033 (238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	4298.1120	0.2100	902.6035	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3044.3677	0.2100	639.3172	(264)
Space and water heating			1541.9207	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	284.1821	0.1443	41.0163	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-970.1480	0.1345	-130.4743	
PV Unit electricity exported	-1355.9105	0.1258	-170.5666	
Total			-301.0408	(269)
Total CO2, kg/year			1293.8254	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.7600	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	4298.1120	1.1300	4856.8666	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3044.3677	1.1300	3440.1354	(278)
Space and water heating			8297.0020	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	284.1821	1.5338	435.8880	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-970.1480	1.4970	-1452.3538	
PV Unit electricity exported	-1355.9105	0.4617	-626.0894	
Total			-2078.4431	(283)
Total Primary energy kWh/year			6784.5477	(286)
Target Primary Energy Rate (TPER)			56.4300	(287)

Full SAP Calculation Printout

Property Reference	78449-04	**Issued on Date**	03/10/2025
Assessment Reference	001	**Prop Type Ref**	End
Property	848 Rochdale Road, MANCHESTER, M9 8FA		

SAP Rating	84 B	**DER**	3.33	**TER**	10.76
Environmental	97 A	**% DER < TER**			69.05
CO_2 Emissions (t/year)	0.38	**DFEE**	33.44	**TFEE**	38.50
Compliance Check	See BREL	**% DFEE < TFEE**			13.15
% DPER < TPER	37.58	**DPER**	35.22	**TPER**	56.43

Assessor Details	Mr. Daniel Goddard	**Assessor ID**	CP52-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.0600 (1b)	x	2.4800 (2b)	=	116.7088	(1b) - (3b)
First floor	49.7800 (1c)	x	2.7800 (2c)	=	138.3884	(1c) - (3c)
Second floor	23.4000 (1d)	x	2.7700 (2d)	=	64.8180	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	120.2400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	319.9152	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.2500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2125	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2709	0.2656	0.2603	0.2338	0.2284	0.2019	0.2019	0.1966	0.2125	0.2284	0.2391	0.2497	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	80.1000 (23c)

Effective ac	0.3704	0.3651	0.3598	0.3332	0.3279	0.3014	0.3014	0.2961	0.3120	0.3279	0.3386	0.3492	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door			4.1400	1.0000	4.1400			(26)
Window			10.9700	0.7752	8.5039			(27)
GF			47.0600	0.0900	4.2354	75.0000	3529.5000	(28a)
Exposed Floor			2.7200	0.1400	0.3808	20.0000	54.4000	(28b)
Main	136.0800	15.1100	120.9700	0.1300	15.7261	9.0000	1088.7300	(29a)
Dwarf Wall (PIRx0.72)	16.7700		16.7700	0.0900	1.5093	9.0000	150.9300	(29a)
PIJ	15.5100		15.5100	0.1300	2.0163	9.0000	139.5900	(30)
PIR	12.2300		12.2300	0.1300	1.5899	9.0000	110.0700	(30)
Residual Ceiling	26.3800		26.3800	0.0900	2.3742	9.0000	237.4200	(30)
Total net area of external elements Aum(A, m2)			256.7500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		40.4759			(33)
Main dwelling								
Party Wall 1			40.6300	0.0000	0.0000	20.0000	812.6000	(32)

Timber	124.1700		9.0000	1117.5300 (32c)
FF	47.0600		18.0000	847.0800 (32d)
SF	23.4000		18.0000	421.2000 (32d)
GF	47.0600		9.0000	423.5400 (32e)
FF	23.4000		9.0000	210.6000 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 9143.1900 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 76.0412 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	10.6900	0.1150	1.2293
E3 Sill	10.6900	0.0170	0.1817
E4 Jamb	35.4000	0.0940	3.3276
E5 Ground floor (normal)	22.8600	0.0670	1.5316
E11 Eaves (insulation at rafter level)	18.1000	0.0250	0.4525
E16 Corner (normal)	29.0400	0.0680	1.9747
E12 Gable (insulation at ceiling level)	5.6600	0.0770	0.4358
E6 Intermediate floor within a dwelling	39.5500	0.0320	1.2656
E17 Corner (inverted - internal area greater than external area)	2.4800	-0.0290	-0.0719
P1 Party wall - Ground floor	6.2400	0.3200	1.9968
E20 Exposed floor (normal)	3.3800	0.0790	0.2670
E21 Exposed floor (inverted)	3.3800	0.0630	0.2129
E13 Gable (insulation at rafter level)	8.2800	0.0740	0.6127
E18 Party wall between dwellings	5.5600	0.0920	0.5115
R6 Flat ceiling	18.1000	-0.0430	-0.7783
E25 Staggered party wall between dwellings	4.9600	0.0560	0.2778

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 13.4275 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 53.9034 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	39.1078	38.5470	37.9861	35.1819	34.6210	31.8168	31.8168	31.2559	32.9385	34.6210	35.7427	36.8644	(38)
Heat transfer coeff	93.0112	92.4503	91.8895	89.0852	88.5244	85.7201	85.7201	85.1593	86.8418	88.5244	89.6461	90.7678	(39)

Average = Sum(39)m / 12 = 88.9450

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7735	0.7689	0.7642	0.7409	0.7362	0.7129	0.7129	0.7082	0.7222	0.7362	0.7456	0.7549	(40)
HLP (average)												0.7397	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.8642 (42)
Hot water usage for mixer showers

72.2437	71.1580	69.5759	66.5490	64.3151	61.8240	60.4080	61.9781	63.6992	66.3739	69.4659	71.9669	(42a)

Hot water usage for baths

31.1904	30.7271	30.0748	28.8721	27.9715	26.9729	26.4334	27.0812	27.7865	28.8550	30.0826	31.0849	(42b)

Hot water usage for other uses

43.9627	42.3640	40.7654	39.1667	37.5681	35.9694	35.9694	37.5681	39.1667	40.7654	42.3640	43.9627	(42c)

Average daily hot water use (litres/day) 135.4907 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	147.3967	144.2491	140.4161	134.5878	129.8547	124.7663	122.8109	126.6274	130.6524	135.9943	141.9125	147.0144	(44)
Energy conte	233.4403	205.4088	215.8143	184.2439	174.8094	153.4147	148.5292	156.7911	161.1075	184.5430	202.1803	230.1891	(45)
Energy content (annual)										Total = Sum(45)m =		2250.4717	
Distribution loss (46)m = 0.15 x (45)m	35.0160	30.8113	32.3722	27.6366	26.2214	23.0122	22.2794	23.5187	24.1661	27.6815	30.3271	34.5284	(46)
Water storage loss:													
Store volume												210.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5800	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8532	(55)
Total storage loss	26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(56)
If cylinder contains dedicated solar storage	26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	283.1519	250.3096	265.5259	232.3519	224.5210	201.5227	198.2408	206.5027	209.2155	234.2546	250.2883	279.9007	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	283.1519	250.3096	265.5259	232.3519	224.5210	201.5227	198.2408	206.5027	209.2155	234.2546	250.2883	279.9007	(64)
										Total per year (kWh/year) = Sum(64)m =		2835.7857	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	117.3882	104.2191	111.5276	99.7475	97.8934	89.4968	89.1552	91.9023	92.0546	101.1298	105.7114	116.3071	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	41.8620	37.1814	30.2380	22.8921	17.1121	14.4468	15.6102	20.2908	27.2342	34.5801	40.3601	43.0254	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	426.1571	430.5793	419.4356	395.7119	365.7649	337.6190	318.8159	314.3937	325.5374	349.2611	379.2081	407.3540	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	(71)
Water heating gains (Table 5)	157.7798	155.0879	149.9026	138.5382	131.5771	124.3011	119.8323	123.5246	127.8537	135.9272	146.8213	156.3268	(72)
Total internal gains	738.1333	735.1831	711.9106	669.4765	626.7886	588.7013	566.5928	570.5435	592.9597	632.1028	678.7239	719.0406	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	5.8000	19.6403	0.3000	0.0000	0.7700	26.3140	(76)
South	2.3600	46.7521	0.3000	0.0000	0.7700	25.4874	(78)
West	2.8100	19.6403	0.3000	0.0000	0.7700	12.7487	(80)

Solar gains	64.5501	118.1567	179.0161	243.6322	287.5543	290.5234	278.0979	245.4860	201.9064	135.6952	78.9178	54.1467 (83)
Total gains	802.6834	853.3397	890.9267	913.1087	914.3429	879.2246	844.6907	816.0295	794.8661	767.7980	757.6417	773.1873 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	27.3061	27.4718	27.6395	28.5095	28.6901	29.6287	29.6287	29.8238	29.2460	28.6901	28.3311	27.9810	
alpha	2.8204	2.8315	2.8426	2.9006	2.9127	2.9752	2.9752	2.9883	2.9497	2.9127	2.8887	2.8654	
util living area	0.9184	0.8998	0.8659	0.8017	0.7042	0.5559	0.4231	0.4506	0.6339	0.8076	0.8912	0.9241	(86)
Living	19.0920	19.3116	19.6827	20.1786	20.5729	20.8558	20.9524	20.9421	20.7716	20.2846	19.6472	19.0884	
Non living	18.5110	18.7288	19.0942	19.5875	19.9603	20.2270	20.3023	20.2993	20.1515	19.6974	19.0756	18.5192	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.0240	19.3116	19.6827	20.1786	20.5729	20.8558	20.9524	20.9421	20.7716	20.2846	19.6472	19.3558	(87)
Th 2	20.2763	20.2804	20.2845	20.3048	20.3089	20.3294	20.3294	20.3336	20.3212	20.3089	20.3008	20.2926	(88)
util rest of house	0.9105	0.8903	0.8528	0.7819	0.6733	0.5102	0.3651	0.3931	0.5906	0.7848	0.8795	0.9168	(89)
MIT 2	19.3733	18.7288	19.0942	19.5875	19.9603	20.2270	20.3023	20.2993	20.1515	19.6974	19.0756	18.7673	(90)
Living area fraction									fLA = Living area / (4) =			0.2917	(91)
MIT	19.5631	18.8988	19.2659	19.7600	20.1390	20.4105	20.4920	20.4868	20.3324	19.8687	19.2424	18.9390	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5631	18.8988	19.2659	19.7600	20.1390	20.4105	20.4920	20.4868	20.3324	19.8687	19.2424	18.9390	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9019	0.8686	0.8314	0.7647	0.6652	0.5159	0.3795	0.4067	0.5914	0.7686	0.8588	0.9003	(94)
Useful gains	723.9102	741.2207	740.7056	698.2720	608.2016	453.6232	320.5702	331.8482	470.0486	590.1173	650.6452	696.1084	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1419.6392	1294.1973	1173.0560	967.4617	747.0582	498.0754	333.6211	348.0287	541.2350	820.5048	1088.5184	1337.8239	(97)
Space heating kWh	517.6223	371.6003	321.6686	193.8166	103.3093	0.0000	0.0000	0.0000	0.0000	171.4083	315.2687	477.4363	(98a)
Space heating requirement - total per year (kWh/year)												2472.1305	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	517.6223	371.6003	321.6686	193.8166	103.3093	0.0000	0.0000	0.0000	0.0000	171.4083	315.2687	477.4363	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2472.1305	
Space heating per m2											(98c) / (4) =	20.5600	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	281.3941	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	517.6223	371.6003	321.6686	193.8166	103.3093	0.0000	0.0000	0.0000	0.0000	171.4083	315.2687	477.4363	(98)
Space heating efficiency (main heating system 1)	281.3941	281.3941	281.3941	281.3941	281.3941	0.0000	0.0000	0.0000	0.0000	281.3941	281.3941	281.3941	(210)
Space heating fuel (main heating system)	183.9493	132.0569	114.3125	68.8773	36.7134	0.0000	0.0000	0.0000	0.0000	60.9140	112.0381	169.6682	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	283.1519	250.3096	265.5259	232.3519	224.5210	201.5227	198.2408	206.5027	209.2155	234.2546	250.2883	279.9007	(64)
Efficiency of water heater												279.7109	(216)
(217)m	279.7109	279.7109	279.7109	279.7109	279.7109	279.7109	279.7109	279.7109	279.7109	279.7109	279.7109	279.7109	(217)
Fuel for water heating, kWh/month	101.2302	89.4887	94.9287	83.0686	80.2689	72.0468	70.8734	73.8272	74.7970	83.7488	89.4811	100.0678	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	45.0156	40.6593	45.0156	43.5635	45.0156	43.5635	45.0156	45.0156	43.5635	45.0156	43.5635	45.0156	(231)
Lighting	36.6415	29.3952	26.4671	19.3909	14.9781	12.2373	13.6635	17.7604	23.0690	30.2678	34.1874	37.6599	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													

(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	878.5297	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	279.7109	
Water heating fuel used	1013.8274	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.3580)		
mechanical ventilation fans (SFP = 1.3580)	530.0227	(230a)
Total electricity for the above, kWh/year	530.0227	(231)
Electricity for lighting (calculated in Appendix L)	295.7182	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2718.0980	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	878.5297	16.4900	144.8695	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1013.8274	16.4900	167.1801	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	530.0227	16.4900	87.4007	(249)
Energy for lighting	295.7182	16.4900	48.7639	(250)
Additional standing charges			0.0000	(251)
Total energy cost			448.2144	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.9765	(257)
SAP value		84.1709	
SAP rating (Section 12)		84	(258)
SAP band		B	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	878.5297	0.1550	136.1562	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1013.8274	0.1410	142.9361	(264)
Space and water heating			279.0924	(265)
Pumps, fans and electric keep-hot	530.0227	0.1387	73.5207	(267)
Energy for lighting	295.7182	0.1443	42.6813	(268)
Total CO2, kg/year			395.2943	(272)
CO2 emissions per m2			3.2900	(273)
EI value			96.7944	
EI rating			97	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.0600	(1b) x	2.4800	(2b) =	116.7088	(1b) - (3b)
First floor	49.7800	(1c) x	2.7800	(2c) =	138.3884	(1c) - (3c)
Second floor	23.4000	(1d) x	2.7700	(2d) =	64.8180	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	120.2400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		319.9152	(5)

2. Ventilation rate

m3 per hour

Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.2500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2125	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.6000	4.5000	4.5000	4.1000	4.2000	3.7000	3.5000	3.5000	3.7000	4.1000	4.1000	4.2000	(22)
Wind factor	1.1500	1.1250	1.1250	1.0250	1.0500	0.9250	0.8750	0.8750	0.9250	1.0250	1.0250	1.0500	(22a)
Adj infilt rate	0.2444	0.2391	0.2391	0.2178	0.2231	0.1966	0.1859	0.1859	0.1966	0.2178	0.2178	0.2231	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	80.1000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.3439	0.3386	0.3386	0.3173	0.3226	0.2961	0.2854	0.2854	0.2961	0.3173	0.3173	0.3226	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Door			4.1400	1.0000	4.1400			(26)
Window			10.9700	0.7752	8.5039			(27)
GF			47.0600	0.0900	4.2354	75.0000	3529.5000	(28a)
Exposed Floor			2.7200	0.1400	0.3808	20.0000	54.4000	(28b)
Main	136.0800	15.1100	120.9700	0.1300	15.7261	9.0000	1088.7300	(29a)
Dwarf Wall (PIRx0.72)	16.7700		16.7700	0.0900	1.5093	9.0000	150.9300	(29a)
PIJ	15.5100		15.5100	0.1300	2.0163	9.0000	139.5900	(30)
PIR	12.2300		12.2300	0.1300	1.5899	9.0000	110.0700	(30)
Residual Ceiling	26.3800		26.3800	0.0900	2.3742	9.0000	237.4200	(30)
Total net area of external elements Aum(A, m2)			256.7500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		40.4759			(33)
Main dwelling								
Party Wall 1			40.6300	0.0000	0.0000	20.0000	812.6000	(32)
Timber			124.1700			9.0000	1117.5300	(32c)
FF			47.0600			18.0000	847.0800	(32d)
SF			23.4000			18.0000	421.2000	(32d)
GF			47.0600			9.0000	423.5400	(32e)
FF			23.4000			9.0000	210.6000	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	9143.1900 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		76.0412 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	10.6900	0.1150	1.2293
E3 Sill	10.6900	0.0170	0.1817
E4 Jamb	35.4000	0.0940	3.3276
E5 Ground floor (normal)	22.8600	0.0670	1.5316
E11 Eaves (insulation at rafter level)	18.1000	0.0250	0.4525
E16 Corner (normal)	29.0400	0.0680	1.9747
E12 Gable (insulation at ceiling level)	5.6600	0.0770	0.4358
E6 Intermediate floor within a dwelling	39.5500	0.0320	1.2656
E17 Corner (inverted - internal area greater than external area)	2.4800	-0.0290	-0.0719
P1 Party wall - Ground floor	6.2400	0.3200	1.9968
E20 Exposed floor (normal)	3.3800	0.0790	0.2670
E21 Exposed floor (inverted)	3.3800	0.0630	0.2129
E13 Gable (insulation at rafter level)	8.2800	0.0740	0.6127
E18 Party wall between dwellings	5.5600	0.0920	0.5115
R6 Flat ceiling	18.1000	-0.0430	-0.7783
E25 Staggered party wall between dwellings	4.9600	0.0560	0.2778

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		13.4275 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	53.9034 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	36.3036	35.7427	35.7427	33.4993	34.0602	31.2559	30.1342	30.1342	31.2559	33.4993	33.4993	34.0602	(38)
Heat transfer coeff	90.2069	89.6461	89.6461	87.4027	87.9635	85.1593	84.0376	84.0376	85.1593	87.4027	87.4027	87.9635	(39)
Average = Sum(39)m / 12 =												87.1690	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7502	0.7456	0.7456	0.7269	0.7316	0.7082	0.6989	0.6989	0.7082	0.7269	0.7269	0.7316	(40)
HLP (average)												0.7250	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.8642 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
72.2437	71.1580	69.5759	66.5490	64.3151	61.8240	60.4080	61.9781	63.6992	66.3739	69.4659	71.9669	(42a)

Hot water usage for baths

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
31.1904	30.7271	30.0748	28.8721	27.9715	26.9729	26.4334	27.0812	27.7865	28.8550	30.0826	31.0849	(42b)

Hot water usage for other uses

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
43.9627	42.3640	40.7654	39.1667	37.5681	35.9694	35.9694	37.5681	39.1667	40.7654	42.3640	43.9627	(42c)

Average daily hot water use (litres/day)	135.4907 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	147.3967	144.2491	140.4161	134.5878	129.8547	124.7663	122.8109	126.6274	130.6524	135.9943	141.9125	147.0144	(44)
Energy conte	233.4403	205.4088	215.8143	184.2439	174.8094	153.4147	148.5292	156.7911	161.1075	184.5430	202.1803	230.1891	(45)
Energy content (annual)										Total = Sum(45)m =		2250.4717	
Distribution loss (46)m = 0.15 x (45)m													
	35.0160	30.8113	32.3722	27.6366	26.2214	23.0122	22.2794	23.5187	24.1661	27.6815	30.3271	34.5284	(46)
Water storage loss:													
Store volume												210.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5800	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8532	(55)
Total storage loss													
	26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(56)
If cylinder contains dedicated solar storage													
	26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	283.1519	250.3096	265.5259	232.3519	224.5210	201.5227	198.2408	206.5027	209.2155	234.2546	250.2883	279.9007	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	283.1519	250.3096	265.5259	232.3519	224.5210	201.5227	198.2408	206.5027	209.2155	234.2546	250.2883	279.9007	(64)
										Total per year (kWh/year) = Sum(64)m =		2835.7857	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
						Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =						0.0000	(64a)
Heat gains from water heating, kWh/month													
	117.3882	104.2191	111.5276	99.7475	97.8934	89.4968	89.1552	91.9023	92.0546	101.1298	105.7114	116.3071	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	41.8620	37.1814	30.2380	22.8921	17.1121	14.4468	15.6102	20.2908	27.2342	34.5801	40.3601	43.0254	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	426.1571	430.5793	419.4356	395.7119	365.7649	337.6190	318.8159	314.3937	325.5374	349.2611	379.2081	407.3540	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	(71)
Water heating gains (Table 5)													
	157.7798	155.0879	149.9026	138.5382	131.5771	124.3011	119.8323	123.5246	127.8537	135.9272	146.8213	156.3268	(72)
Total internal gains													
	738.1333	735.1831	711.9106	669.4765	626.7886	588.7013	566.5928	570.5435	592.9597	632.1028	678.7239	719.0406	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	5.8000	16.6187	0.3000	0.0000	0.7700	22.2657	(76)
South	2.3600	39.5594	0.3000	0.0000	0.7700	21.5662	(78)
West	2.8100	16.6187	0.3000	0.0000	0.7700	10.7874	(80)

Solar gains	54.6193	105.0282	167.8276	232.2627	268.0845	275.9972	258.9695	225.1592	191.3721	125.4152	69.3520	48.9899	(83)
Total gains	792.7526	840.2112	879.7382	901.7392	894.8731	864.6985	825.5623	795.7027	784.3319	757.5181	748.0759	768.0305	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	28.1550	28.3311	28.3311	29.0583	28.8730	29.8238	30.2219	30.2219	29.8238	29.0583	29.0583	28.8730	
alpha	2.8770	2.8887	2.8887	2.9372	2.9249	2.9883	3.0148	3.0148	2.9883	2.9372	2.9372	2.9249	
util living area													
	0.9143	0.8951	0.8625	0.7909	0.6844	0.5337	0.4250	0.4474	0.6332	0.8032	0.8849	0.9192	(86)
Living	19.2373	19.4471	19.7603	20.2600	20.6353	20.8806	20.9542	20.9462	20.7806	20.3232	19.7615	19.2427	
Non living	18.6686	18.8765	19.1818	19.6748	20.0209	20.2513	20.3155	20.3103	20.1702	19.7406	19.1992	18.6858	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.0983	19.4471	19.7603	20.2600	20.6353	20.8806	20.9542	20.9462	20.7806	20.3232	19.7615	19.4885	(87)
Th 2	20.2967	20.3008	20.3008	20.3171	20.3130	20.3336	20.3418	20.3418	20.3336	20.3171	20.3171	20.3130	(88)
util rest of house													
	0.9060	0.8851	0.8491	0.7700	0.6508	0.4858	0.3678	0.3894	0.5905	0.7798	0.8725	0.9115	(89)
MIT 2	19.4638	18.8765	19.1818	19.6748	20.0209	20.2513	20.3155	20.3103	20.1702	19.7406	19.1992	18.9134	(90)
Living area fraction										fLA = Living area / (4) =		0.2917	(91)
MIT	19.6489	19.0430	19.3505	19.8456	20.2002	20.4349	20.5019	20.4958	20.3483	19.9106	19.3633	19.0812	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6489	19.0430	19.3505	19.8456	20.2002	20.4349	20.5019	20.4958	20.3483	19.9106	19.3633	19.0812	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8976	0.8641	0.8284	0.7541	0.6450	0.4934	0.3820	0.4033	0.5915	0.7643	0.8524	0.8952	(94)
Useful gains	711.5364	725.9850	728.7616	680.0249	577.1717	426.6080	315.3791	320.9309	463.9177	578.9867	637.6776	687.5499	(95)
Ext temp.	4.7000	5.3000	6.7000	9.3000	12.3000	15.0000	16.6000	16.5000	14.1000	10.8000	7.5000	4.6000	(96)

Heat loss rate W

1348.4944	1232.0040	1134.0715	921.7102	694.9275	462.8308	327.9043	335.7991	532.0977	796.2877	1036.8804	1273.8143	(97)

Space heating kWh

473.8968	340.0448	301.5505	174.0134	87.6103	0.0000	0.0000	0.0000	0.0000	161.6720	287.4260	436.1807	(98a)

Space heating requirement - total per year (kWh/year) 2262.3945

Solar heating kWh

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)

Solar heating contribution - total per year (kWh/year) 0.0000

Space heating kWh

473.8968	340.0448	301.5505	174.0134	87.6103	0.0000	0.0000	0.0000	0.0000	161.6720	287.4260	436.1807	(98c)

Space heating requirement after solar contribution - total per year (kWh/year) 2262.3945

Space heating per m2 (98c) / (4) = 18.8157 (99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (201)

Fraction of space heat from main system(s) 1.0000 (202)

Efficiency of main space heating system 1 (in %) 280.5326 (206)

Efficiency of main space heating system 2 (in %) 0.0000 (207)

Efficiency of secondary/supplementary heating system, % 0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	473.8968	340.0448	301.5505	174.0134	87.6103	0.0000	0.0000	0.0000	0.0000	161.6720	287.4260	436.1807	(98)
Space heating efficiency (main heating system 1)													
	280.5326	280.5326	280.5326	280.5326	0.0000	0.0000	0.0000	0.0000	280.5326	280.5326	280.5326		(210)
Space heating fuel (main heating system)													
	168.9275	121.2140	107.4921	62.0297	31.2300	0.0000	0.0000	0.0000	0.0000	57.6304	102.4573	155.4831	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	283.1519	250.3096	265.5259	232.3519	224.5210	201.5227	198.2408	206.5027	209.2155	234.2546	250.2883	279.9007	(64)
Efficiency of water heater												279.7193	(216)
(217)m	279.7193	279.7193	279.7193	279.7193	279.7193	279.7193	279.7193	279.7193	279.7193	279.7193	279.7193	279.7193	(217)
Fuel for water heating, kWh/month													
	101.2272	89.4860	94.9259	83.0661	80.2665	72.0446	70.8713	73.8250	74.7948	83.7463	89.4784	100.0649	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	45.0156	40.6593	45.0156	43.5635	45.0156	43.5635	45.0156	45.0156	43.5635	45.0156	43.5635	45.0156	(231)
Lighting	36.6415	29.3952	26.4671	19.3909	14.9781	12.2373	13.6635	17.7604	23.0690	30.2678	34.1874	37.6599	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year

Space heating fuel - main system 1 806.4640 (211)

Space heating fuel - main system 2 0.0000 (213)

Space heating fuel - secondary 0.0000 (215)

Efficiency of water heater 279.7193

Water heating fuel used 1013.7971 (219)

Space cooling fuel 0.0000 (221)

Electricity for pumps and fans:

(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.3580)

mechanical ventilation fans (SFP = 1.3580) 530.0227 (230a)

Total electricity for the above, kWh/year 530.0227 (231)

Electricity for lighting (calculated in Appendix L) 295.7182 (232)

Energy saving/generation technologies (Appendices M ,N and Q)

PV generation 0.0000 (233)

Wind generation 0.0000 (234)

Hydro-electric generation (Appendix N) 0.0000 (235a)

Electricity generated - Micro CHP (Appendix N) 0.0000 (235)

Appendix Q - special features

Energy saved or generated -0.0000 (236)

Energy used 0.0000 (237)

Total delivered energy for all uses 2646.0019 (238)

10a. Fuel costs - using BEDF prices (583)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	806.4640	28.4300	229.2777	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1013.7971	28.4300	288.2225	(247)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(247a)
Pumps, fans and electric keep-hot	530.0227	28.4300	150.6855	(249)
Energy for lighting	295.7182	28.4300	84.0727	(250)
Additional standing charges			0.0000	(251)
Total energy cost			752.2583	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy	Emission factor	Emissions	

	kWh/year	kg CO2/kWh	kg CO2/year	
Space heating - main system 1	806.4640	0.1550	125.0208	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1013.7971	0.1410	142.9318	(264)
Space and water heating			267.9527	(265)
Pumps, fans and electric keep-hot	530.0227	0.1387	73.5207	(267)
Energy for lighting	295.7182	0.1443	42.6813	(268)
Total CO2, kg/year			384.1546	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	806.4640	1.5739	1269.3071	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1013.7971	1.5213	1542.3116	(278)
Space and water heating			2811.6187	(279)
Pumps, fans and electric keep-hot	530.0227	1.5128	801.8183	(281)
Energy for lighting	295.7182	1.5338	453.5824	(282)
Total Primary energy kWh/year			4067.0194	(286)

SAP 10 EPC IMPROVEMENTS

001

Current energy efficiency rating: B 84
Current environmental impact rating: A 97

N Solar water heating	Recommended	
U Solar photovoltaic panels	Recommended	
V2 Wind turbine	Not applicable	

Recommended measures:	SAP change	Cost change	CO2 change
N Solar water heating	+ 1.2	-£ 54	-23 kg (6.1%)
U Solar photovoltaic panels	+ 6.9	-£ 288	-207 kg (57.4%)

	Typical annual savings		Energy efficiency	Environmental impact
Recommended measures				
Solar water heating	£54	0.19 kg/m²	B 85	A 97
Solar photovoltaic panels	£288	1.72 kg/m²	A 92	A 99
Total Savings	£342	1.92 kg/m²		

Potential energy efficiency rating: A 92
Potential environmental impact rating: A 99

Fuel prices for cost data on this page from database revision number 583 TEST (01 Oct 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, West Pennines (England)):

	Current	Potential	Saving
Electricity	£752	£699	£54
Space heating	£380	£406	-£26
Water heating	£288	£209	£79
Lighting	£84	£84	£0
Generated (PV)	-£0	-£288	£288
Total cost of fuels	£752	£411	£342
Total cost of uses	£752	£411	£341
Delivered energy	22 kWh/m²	7 kWh/m²	15 kWh/m²
Carbon dioxide emissions	0.4 tonnes	0.2 tonnes	0.2 tonnes
CO2 emissions per m²	3 kg/m²	1 kg/m²	2 kg/m²
Primary energy	34 kWh/m²	18 kWh/m²	16 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.0600 (1b)	x	2.4800 (2b)	=	116.7088	(1b) - (3b)
First floor	49.7800 (1c)	x	2.7800 (2c)	=	138.3884	(1c) - (3c)
Second floor	23.4000 (1d)	x	2.7700 (2d)	=	64.8180	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	120.2400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	319.9152	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)

Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.2500 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2125 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2709	0.2656	0.2603	0.2338	0.2284	0.2019	0.2019	0.1966	0.2125	0.2284	0.2391	0.2497	(22b)

Balanced mechanical ventilation with heat recovery		
If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =		80.1000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.3704	0.3651	0.3598	0.3332	0.3279	0.3014	0.3014	0.2961	0.3120	0.3279	0.3386	0.3492	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Door			4.1400	1.0000	4.1400			(26)
Window			10.9700	0.7752	8.5039			(27)
GF			47.0600	0.0900	4.2354	75.0000	3529.5000	(28a)
Exposed Floor			2.7200	0.1400	0.3808	20.0000	54.4000	(28b)
Main	136.0800	15.1100	120.9700	0.1300	15.7261	9.0000	1088.7300	(29a)
Dwarf Wall (PIRx0.72)	16.7700		16.7700	0.0900	1.5093	9.0000	150.9300	(29a)
PIJ	15.5100		15.5100	0.1300	2.0163	9.0000	139.5900	(30)
PIR	12.2300		12.2300	0.1300	1.5899	9.0000	110.0700	(30)
Residual Ceiling	26.3800		26.3800	0.0900	2.3742	9.0000	237.4200	(30)
Total net area of external elements Aum(A, m2)			256.7500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		40.4759			(33)
Main dwelling								
Party Wall 1			40.6300	0.0000	0.0000	20.0000	812.6000	(32)
Timber			124.1700			9.0000	1117.5300	(32c)
FF			47.0600			18.0000	847.0800	(32d)
SF			23.4000			18.0000	421.2000	(32d)
GF			47.0600			9.0000	423.5400	(32e)
FF			23.4000			9.0000	210.6000	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	9143.1900 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		76.0412 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	10.6900	0.1150	1.2293
E3 Sill	10.6900	0.0170	0.1817
E4 Jamb	35.4000	0.0940	3.3276
E5 Ground floor (normal)	22.8600	0.0670	1.5316
E11 Eaves (insulation at rafter level)	18.1000	0.0250	0.4525
E16 Corner (normal)	29.0400	0.0680	1.9747
E12 Gable (insulation at ceiling level)	5.6600	0.0770	0.4358
E6 Intermediate floor within a dwelling	39.5500	0.0320	1.2656
E17 Corner (inverted - internal area greater than external area)	2.4800	-0.0290	-0.0719
P1 Party wall - Ground floor	6.2400	0.3200	1.9968
E20 Exposed floor (normal)	3.3800	0.0790	0.2670
E21 Exposed floor (inverted)	3.3800	0.0630	0.2129
E13 Gable (insulation at rafter level)	8.2800	0.0740	0.6127
E18 Party wall between dwellings	5.5600	0.0920	0.5115
R6 Flat ceiling	18.1000	-0.0430	-0.7783
E25 Staggered party wall between dwellings	4.9600	0.0560	0.2778

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		13.4275 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	53.9034 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	39.1078	38.5470	37.9861	35.1819	34.6210	31.8168	31.8168	31.2559	32.9385	34.6210	35.7427	36.8644	(38)
Heat transfer coeff	93.0112	92.4503	91.8895	89.0852	88.5244	85.7201	85.7201	85.1593	86.8418	88.5244	89.6461	90.7678	(39)
Average = Sum(39)m / 12 =												88.9450	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7735	0.7689	0.7642	0.7409	0.7362	0.7129	0.7129	0.7082	0.7222	0.7362	0.7456	0.7549	(40)
HLP (average)												0.7397	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.8642 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	72.2437	71.1580	69.5759	66.5490	64.3151	61.8240	60.4080	61.9781	63.6992	66.3739	69.4659	71.9669	(42a)
Hot water usage for baths	31.1904	30.7271	30.0748	28.8721	27.9715	26.9729	26.4334	27.0812	27.7865	28.8550	30.0826	31.0849	(42b)
Hot water usage for other uses	43.9627	42.3640	40.7654	39.1667	37.5681	35.9694	35.9694	37.5681	39.1667	40.7654	42.3640	43.9627	(42c)
Average daily hot water use (litres/day)												135.4907	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use												

	147.3967	144.2491	140.4161	134.5878	129.8547	124.7663	122.8109	126.6274	130.6524	135.9943	141.9125	147.0144	(44)
Energy conte	233.4403	205.4088	215.8143	184.2439	174.8094	153.4147	148.5292	156.7911	161.1075	184.5430	202.1803	230.1891	(45)
Energy content (annual)											Total = Sum(45)m =	2250.4717	
Distribution loss (46)m = 0.15 x (45)m													
	35.0160	30.8113	32.3722	27.6366	26.2214	23.0122	22.2794	23.5187	24.1661	27.6815	30.3271	34.5284	(46)
Water storage loss:													
Store volume												210.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5800	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8532	(55)
Total storage loss													
	26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(56)
If cylinder contains dedicated solar storage													
	17.0031	15.3576	17.0031	16.4546	17.0031	16.4546	17.0031	17.0031	16.4546	17.0031	16.4546	17.0031	(57)
Primary loss	23.2624	21.0112	21.8667	15.7584	10.4681	9.9053	10.2355	11.1660	17.1091	21.8667	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	273.7058	241.7776	254.6841	216.4569	202.2805	179.7746	175.7677	184.9602	194.6712	223.4127	241.1469	270.4545	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Aperture area of solar collector												3.0000	(H1)
Zero-loss collector efficiency												0.8000	(H2)
Collector linear heat loss coefficient												1.8000	(H3)
Collector 2nd order heat loss coefficient												0.0000	(H4)
Collector loop efficiency												0.9000	(H5)
Incidence angle modifier												1.0000	(H6)
Overshading factor												0.8000	(H8)
Overall heat loss coefficient of system												6.5000	(H10)
Heat loss coefficient of collector loop												3.9667	(H11)
Dedicated solar storage volume												75.0000	(H12)
If combined cylinder, total volume of cylinder												210.0000	(H13)
Effective solar volume												115.5000	(H14)
Reference volume												225.0000	(H15)
Storage tank correction coefficient												1.1814	(H16)
Heat delivered to hot water												661.7243	(H24)
Heat delivered to space heating												0.0000	(H29)
Solar input												661.7243	
Solar input	-0.0000	-20.2144	-62.8139	-84.6635	-109.0628	-100.4582	-99.7212	-87.9174	-62.1691	-33.3828	-1.3210	-0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	273.7058	221.5632	191.8702	131.7934	93.2177	79.3164	76.0465	97.0428	132.5020	190.0299	239.8259	270.4545	(64)
										Total per year (kWh/year) = Sum(64)m =		1997.3683	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	109.8313	97.3935	102.8540	87.0315	80.1010	72.0983	71.1768	74.6683	80.4192	92.4563	98.3982	108.7502	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	41.8620	37.1814	30.2380	22.8921	17.1121	14.4468	15.6102	20.2908	27.2342	34.5801	40.3601	43.0254	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	426.1571	430.5793	419.4356	395.7119	365.7649	337.6190	318.8159	314.3937	325.5374	349.2611	379.2081	407.3540	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	(71)
Water heating gains (Table 5)													
	147.6227	144.9308	138.2447	120.8771	107.6627	100.1365	95.6677	100.3606	111.6933	124.2693	136.6642	146.1697	(72)
Total internal gains													
	727.9762	725.0259	700.2526	651.8154	602.8741	564.5367	542.4282	547.3794	576.7994	620.4449	668.5668	708.8835	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	5.8000	19.6403	0.3000	0.0000	0.7700	26.3140	(76)
South	2.3600	46.7521	0.3000	0.0000	0.7700	25.4874	(78)
West	2.8100	19.6403	0.3000	0.0000	0.7700	12.7487	(80)

Solar gains	64.5501	118.1567	179.0161	243.6322	287.5543	290.5234	278.0979	245.4860	201.9064	135.6952	78.9178	54.1467	(83)
Total gains	792.5262	843.1826	879.2687	895.4476	890.4284	855.0600	820.5261	792.8655	778.7058	756.1401	747.4846	763.0302	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	27.3061	27.4718	27.6395	28.5095	28.6901	29.6287	29.6287	29.8238	29.2460	28.6901	28.3311	27.9810	
alpha	2.8204	2.8315	2.8426	2.9006	2.9127	2.9752	2.9752	2.9883	2.9497	2.9127	2.8887	2.8654	
util living area													
	0.9205	0.9022	0.8692	0.8080	0.7146	0.5675	0.4339	0.4617	0.6425	0.8125	0.8941	0.9262	(86)
Living	19.0742	19.2949	19.6658	20.1584	20.5548	20.8475	20.9491	20.9381	20.7630	20.2709	19.6309	19.0701	
Non living	18.4937	18.7127	19.0781	19.5689	19.9446	20.2208	20.3003	20.2968	20.1447	19.6850	19.0600	18.5014	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.0148	19.2949	19.6658	20.1584	20.5548	20.8475	20.9491	20.9381	20.7630	20.2709	19.6309	19.3400	(87)
Th 2	20.2763	20.2804	20.2845	20.3048	20.3089	20.3294	20.3294	20.3336	20.3212	20.3089	20.3008	20.2926	(88)
util rest of house													
	0.9128	0.8928	0.8563	0.7885	0.6840	0.5216	0.3749	0.4033	0.5992	0.7900	0.8826	0.9191	(89)
MIT 2	19.3644	18.7127	19.0781	19.5689	19.9446	20.2208	20.3003	20.2968	20.1447	19.6850	19.0600	18.7519	(90)
Living area fraction											fLA = Living area / (4) =	0.2917	(91)

MIT	19.5542	18.8825	19.2496	19.7409	20.1227	20.4036	20.4896	20.4839	20.3251	19.8559	19.2266	18.9235	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5542	18.8825	19.2496	19.7409	20.1227	20.4036	20.4896	20.4839	20.3251	19.8559	19.2266	18.9235	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9042	0.8712	0.8348	0.7710	0.6752	0.5269	0.3893	0.4168	0.5995	0.7735	0.8619	0.9027	(94)
Useful gains	716.6284	734.6214	734.0434	690.4149	601.1826	450.5030	319.4479	330.4999	466.8113	584.8776	644.2932	688.8200	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1418.8071	1292.6897	1171.5499	965.7611	745.6101	497.4858	333.4170	347.7831	540.5983	819.3747	1087.0997	1336.4195	(97)
Space heating kWh													
	522.4209	375.0219	325.5048	198.2493	107.4540	0.0000	0.0000	0.0000	0.0000	174.4659	318.8207	481.8140	(98a)
Space heating requirement - total per year (kWh/year)												2503.7516	
Solar heating kWh													
	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	522.4209	375.0219	325.5048	198.2493	107.4540	0.0000	0.0000	0.0000	0.0000	174.4659	318.8207	481.8140	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2503.7516	
Space heating per m2											(98c) / (4) =	20.8230	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												281.3941	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	522.4209	375.0219	325.5048	198.2493	107.4540	0.0000	0.0000	0.0000	0.0000	174.4659	318.8207	481.8140	(98)
Space heating efficiency (main heating system 1)													
	281.3941	281.3941	281.3941	281.3941	281.3941	0.0000	0.0000	0.0000	0.0000	281.3941	281.3941	281.3941	(210)
Space heating fuel (main heating system)													
	185.6546	133.2728	115.6758	70.4525	38.1863	0.0000	0.0000	0.0000	0.0000	62.0006	113.3004	171.2239	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	273.7058	221.5632	191.8702	131.7934	93.2177	79.3164	76.0465	97.0428	132.5020	190.0299	239.8259	270.4545	(64)
Efficiency of water heater												279.7109	(216)
(217)m	279.7109	279.7109	279.7109	279.7109	279.7109	279.7109	279.7109	279.7109	279.7109	279.7109	279.7109	279.7109	(217)
Fuel for water heating, kWh/month													
	97.8531	79.2115	68.5959	47.1177	33.3265	28.3566	27.1875	34.6939	47.3711	67.9380	85.7406	96.6907	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	51.8101	46.7963	51.8101	50.1389	51.8101	50.1389	51.8101	51.8101	50.1389	51.8101	50.1389	51.8101	(231)
Lighting	36.6415	29.3952	26.4671	19.3909	14.9781	12.2373	13.6635	17.7604	23.0690	30.2678	34.1874	37.6599	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-38.4095	-57.3382	-86.7385	-101.1631	-110.6203	-101.0514	-99.8726	-93.0709	-80.9461	-66.6795	-43.0445	-32.7239	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-11.6770	-26.2417	-55.6077	-89.6089	-125.0625	-130.6623	-128.7789	-106.7030	-75.5170	-40.1664	-16.3653	-9.1899	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	889.7670	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	279.7109	
Water heating fuel used	714.0831	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.3580)		
mechanical ventilation fans (SFP = 1.3580)	530.0227	(230a)
pump for solar water heating	80.0000	(230g)
Total electricity for the above, kWh/year	610.0227	(231)
Electricity for lighting (calculated in Appendix L)	295.7182	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1727.2394	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	782.3516	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	889.7670	16.4900	146.7226	(240)

Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	714.0831	16.4900	117.7523	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	530.0227	16.4900	87.4007	(249)
Pump for solar water heating	80.0000	16.4900	13.1920	(249)
Energy for lighting	295.7182	16.4900	48.7639	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-911.6587	16.4900	-150.3325	
PV Unit electricity exported	-815.5807	5.5900	-45.5910	
Total			-195.9235	(252)
Total energy cost			217.9081	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.4747	(257)
SAP value		92.3044	
SAP rating (Section 12)		92	(258)
SAP band		A	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	889.7670	0.1549	137.8490	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	714.0831	0.1460	104.2886	(264)
Space and water heating			242.1376	(265)
Pumps, fans and electric keep-hot	610.0227	0.1387	84.6177	(267)
Energy for lighting	295.7182	0.1443	42.6813	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-911.6587	0.1340	-122.1876	
PV Unit electricity exported	-815.5807	0.1237	-100.8964	
Total			-223.0840	(269)
Total CO2, kg/year			146.3525	(272)
CO2 emissions per m2			1.2200	(273)
EI value			98.8132	
EI rating			99	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.0600	(1b) x	2.4800	(2b) =	116.7088	(1b) - (3b)
First floor	49.7800	(1c) x	2.7800	(2c) =	138.3884	(1c) - (3c)
Second floor	23.4000	(1d) x	2.7700	(2d) =	64.8180	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	120.2400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		319.9152	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.2500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2125	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.6000	4.5000	4.5000	4.1000	4.2000	3.7000	3.5000	3.5000	3.7000	4.1000	4.1000	4.2000	(22)
Wind factor	1.1500	1.1250	1.1250	1.0250	1.0500	0.9250	0.8750	0.8750	0.9250	1.0250	1.0250	1.0500	(22a)
Adj infilt rate	0.2444	0.2391	0.2391	0.2178	0.2231	0.1966	0.1859	0.1859	0.1966	0.2178	0.2178	0.2231	(22b)

Balanced mechanical ventilation with heat recovery		
If mechanical ventilation		0.5000 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 80.1000 (23c)

Effective ac	0.3439	0.3386	0.3386	0.3173	0.3226	0.2961	0.2854	0.2854	0.2961	0.3173	0.3173	0.3226	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Door			4.1400	1.0000	4.1400			(26)
Window			10.9700	0.7752	8.5039			(27)
GF			47.0600	0.0900	4.2354	75.0000	3529.5000	(28a)
Exposed Floor			2.7200	0.1400	0.3808	20.0000	54.4000	(28b)
Main	136.0800	15.1100	120.9700	0.1300	15.7261	9.0000	1088.7300	(29a)
Dwarf Wall (PIRx0.72)	16.7700		16.7700	0.0900	1.5093	9.0000	150.9300	(29a)
PIJ	15.5100		15.5100	0.1300	2.0163	9.0000	139.5900	(30)
PIR	12.2300		12.2300	0.1300	1.5899	9.0000	110.0700	(30)
Residual Ceiling	26.3800		26.3800	0.0900	2.3742	9.0000	237.4200	(30)
Total net area of external elements Aum(A, m2)			256.7500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		40.4759			(33)
Main dwelling								
Party Wall 1			40.6300	0.0000	0.0000	20.0000	812.6000	(32)
Timber			124.1700			9.0000	1117.5300	(32c)
FF			47.0600			18.0000	847.0800	(32d)
SF			23.4000			18.0000	421.2000	(32d)
GF			47.0600			9.0000	423.5400	(32e)
FF			23.4000			9.0000	210.6000	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 9143.1900 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 76.0412 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	10.6900	0.1150	1.2293
E3 Sill	10.6900	0.0170	0.1817
E4 Jamb	35.4000	0.0940	3.3276
E5 Ground floor (normal)	22.8600	0.0670	1.5316
E11 Eaves (insulation at rafter level)	18.1000	0.0250	0.4525
E16 Corner (normal)	29.0400	0.0680	1.9747
E12 Gable (insulation at ceiling level)	5.6600	0.0770	0.4358
E6 Intermediate floor within a dwelling	39.5500	0.0320	1.2656
E17 Corner (inverted - internal area greater than external area)	2.4800	-0.0290	-0.0719
P1 Party wall - Ground floor	6.2400	0.3200	1.9968
E20 Exposed floor (normal)	3.3800	0.0790	0.2670
E21 Exposed floor (inverted)	3.3800	0.0630	0.2129
E13 Gable (insulation at rafter level)	8.2800	0.0740	0.6127
E18 Party wall between dwellings	5.5600	0.0920	0.5115
R6 Flat ceiling	18.1000	-0.0430	-0.7783
E25 Staggered party wall between dwellings	4.9600	0.0560	0.2778

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 13.4275 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 53.9034 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	36.3036	35.7427	35.7427	33.4993	34.0602	31.2559	30.1342	30.1342	31.2559	33.4993	33.4993	34.0602	(38)
Heat transfer coeff	90.2069	89.6461	89.6461	87.4027	87.9635	85.1593	84.0376	84.0376	85.1593	87.4027	87.4027	87.9635	(39)
Average = Sum(39)m / 12 =												87.1690	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7502	0.7456	0.7456	0.7269	0.7316	0.7082	0.6989	0.6989	0.7082	0.7269	0.7269	0.7316	(40)
HLP (average)												0.7250	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.8642 (42)
Hot water usage for mixer showers

72.2437	71.1580	69.5759	66.5490	64.3151	61.8240	60.4080	61.9781	63.6992	66.3739	69.4659	71.9669	(42a)

Hot water usage for baths

31.1904	30.7271	30.0748	28.8721	27.9715	26.9729	26.4334	27.0812	27.7865	28.8550	30.0826	31.0849	(42b)

Hot water usage for other uses

43.9627	42.3640	40.7654	39.1667	37.5681	35.9694	35.9694	37.5681	39.1667	40.7654	42.3640	43.9627	(42c)

Average daily hot water use (litres/day) 135.4907 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	147.3967	144.2491	140.4161	134.5878	129.8547	124.7663	122.8109	126.6274	130.6524	135.9943	141.9125	147.0144	(44)
Energy conte	233.4403	205.4088	215.8143	184.2439	174.8094	153.4147	148.5292	156.7911	161.1075	184.5430	202.1803	230.1891	(45)
Energy content (annual)										Total = Sum(45)m =		2250.4717	
Distribution loss (46)m = 0.15 x (45)m	35.0160	30.8113	32.3722	27.6366	26.2214	23.0122	22.2794	23.5187	24.1661	27.6815	30.3271	34.5284	(46)
Water storage loss:													
Store volume												210.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5800	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8532	(55)
Total storage loss	26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(56)
If cylinder contains dedicated solar storage	17.0031	15.3576	17.0031	16.4546	17.0031	16.4546	17.0031	17.0031	16.4546	17.0031	16.4546	17.0031	(57)
Primary loss	23.2624	21.0112	21.8667	15.7584	10.4681	9.9053	10.2355	11.1660	17.1091	21.8667	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	273.7058	241.7776	254.6841	216.4569	202.2805	179.7746	175.7677	184.9602	194.6712	223.4127	241.1469	270.4545	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)

Aperture area of solar collector 3.0000 (H1)
Zero-loss collector efficiency 0.8000 (H2)
Collector linear heat loss coefficient 1.8000 (H3)
Collector 2nd order heat loss coefficient 0.0000 (H4)
Collector loop efficiency 0.9000 (H5)
Incidence angle modifier 1.0000 (H6)
Overshading factor 0.8000 (H8)

Overall heat loss coefficient of system												6.5000	(H10)
Heat loss coefficient of collector loop												3.9667	(H11)
Dedicated solar storage volume												75.0000	(H12)
If combined cylinder, total volume of cylinder												210.0000	(H13)
Effective solar volume												115.5000	(H14)
Reference volume												225.0000	(H15)
Storage tank correction coefficient												1.1814	(H16)
Heat delivered to hot water												605.2985	(H24)
Heat delivered to space heating												0.0000	(H29)
Solar input												605.2985	
Solar input	-0.0000	-14.4753	-57.1346	-80.0537	-101.5431	-95.3649	-92.1367	-79.1730	-57.3788	-28.0385	-0.0000	-0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	273.7058	227.3023	197.5495	136.4032	100.7374	84.4097	83.6309	105.7872	137.2924	195.3743	241.1469	270.4545	(64)
											Total per year (kWh/year) = Sum(64)m =	2053.7941	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
											Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	0.0000	(64a)
Heat gains from water heating, kWh/month													
	109.8313	97.3935	102.8540	87.0315	80.1010	72.0983	71.1768	74.6683	80.4192	92.4563	98.3982	108.7502	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	41.8620	37.1814	30.2380	22.8921	17.1121	14.4468	15.6102	20.2908	27.2342	34.5801	40.3601	43.0254	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	426.1571	430.5793	419.4356	395.7119	365.7649	337.6190	318.8159	314.3937	325.5374	349.2611	379.2081	407.3540	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	(71)
Water heating gains (Table 5)													
	147.6227	144.9308	138.2447	120.8771	107.6627	100.1365	95.6677	100.3606	111.6933	124.2693	136.6642	146.1697	(72)
Total internal gains													
	727.9762	725.0259	700.2526	651.8154	602.8741	564.5367	542.4282	547.3794	576.7994	620.4449	668.5668	708.8835	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	5.8000	16.6187	0.3000	0.0000	0.7700	22.2657	(76)
South	2.3600	39.5594	0.3000	0.0000	0.7700	21.5662	(78)
West	2.8100	16.6187	0.3000	0.0000	0.7700	10.7874	(80)

Solar gains	54.6193	105.0282	167.8276	232.2627	268.0845	275.9972	258.9695	225.1592	191.3721	125.4152	69.3520	48.9899	(83)
Total gains	782.5955	830.0541	868.0802	884.0781	870.9586	840.5339	801.3977	772.5386	768.1715	745.8601	737.9188	757.8733	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	28.1550	28.3311	28.3311	29.0583	28.8730	29.8238	30.2219	30.2219	29.8238	29.0583	29.0583	28.8730	
alpha	2.8770	2.8887	2.8887	2.9372	2.9249	2.9883	3.0148	3.0148	2.9883	2.9372	2.9372	2.9249	
util living area													
	0.9165	0.8976	0.8659	0.7975	0.6952	0.5455	0.4361	0.4588	0.6420	0.8083	0.8880	0.9215	(86)
Living	19.2196	19.4305	19.7434	20.2407	20.6188	20.8734	20.9509	20.9424	20.7721	20.3098	19.7454	19.2245	
Non living	18.6514	18.8606	19.1658	19.6571	20.0069	20.2460	20.3135	20.3079	20.1634	19.7284	19.1839	18.6681	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.0892	19.4305	19.7434	20.2407	20.6188	20.8734	20.9509	20.9424	20.7721	20.3098	19.7454	19.4729	(87)
Th 2	20.2967	20.3008	20.3008	20.3171	20.3130	20.3336	20.3418	20.3418	20.3336	20.3171	20.3171	20.3130	(88)
util rest of house													
	0.9085	0.8878	0.8528	0.7769	0.6620	0.4972	0.3778	0.3998	0.5993	0.7852	0.8759	0.9140	(89)
MIT 2	19.4550	18.8606	19.1658	19.6571	20.0069	20.2460	20.3135	20.3079	20.1634	19.7284	19.1839	18.8982	(90)
Living area fraction											fLA = Living area / (4) =	0.2917	(91)
MIT	19.6400	19.0269	19.3343	19.8273	20.1854	20.4290	20.4995	20.4931	20.3410	19.8980	19.3477	19.0659	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6400	19.0269	19.3343	19.8273	20.1854	20.4290	20.4995	20.4931	20.3410	19.8980	19.3477	19.0659	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9001	0.8668	0.8320	0.7607	0.6554	0.5044	0.3921	0.4138	0.5998	0.7694	0.8558	0.8978	(94)
Useful gains	704.3904	719.5206	722.2056	672.5359	570.8028	423.9277	314.2625	319.6414	460.7224	573.8547	631.4934	680.4151	(95)
Ext temp.	4.7000	5.3000	6.7000	9.3000	12.3000	15.0000	16.6000	16.5000	14.1000	10.8000	7.5000	4.6000	(96)
Heat loss rate W													
	1347.6940	1230.5591	1132.6162	920.1184	693.6316	462.3306	327.7036	335.5662	531.4779	795.1929	1035.5250	1272.4682	(97)
Space heating kWh													
	478.6179	343.4179	305.3455	178.2594	91.3846	0.0000	0.0000	0.0000	0.0000	164.6756	290.9028	440.4875	(98a)
Space heating requirement - total per year (kWh/year)												2293.0912	
Solar heating kWh													
	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	478.6179	343.4179	305.3455	178.2594	91.3846	0.0000	0.0000	0.0000	0.0000	164.6756	290.9028	440.4875	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2293.0912	
Space heating per m2											(98c) / (4) =	19.0710	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												280.5326	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	478.6179	343.4179	305.3455	178.2594	91.3846	0.0000	0.0000	0.0000	0.0000	164.6756	290.9028	440.4875	(98)
Space heating efficiency (main heating system 1)													
	280.5326	280.5326	280.5326	280.5326	280.5326	0.0000	0.0000	0.0000	0.0000	280.5326	280.5326	280.5326	(210)
Space heating fuel (main heating system)													
	170.6104	122.4164	108.8449	63.5432	32.5754	0.0000	0.0000	0.0000	0.0000	58.7011	103.6966	157.0183	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	273.7058	227.3023	197.5495	136.4032	100.7374	84.4097	83.6309	105.7872	137.2924	195.3743	241.1469	270.4545	(64)
Efficiency of water heater												279.7193	(216)
(217)m	279.7193	279.7193	279.7193	279.7193	279.7193	279.7193	279.7193	279.7193	279.7193	279.7193	279.7193	279.7193	(217)
Fuel for water heating, kWh/month													
	97.8502	81.2609	70.6242	48.7643	36.0138	30.1766	29.8982	37.8191	49.0822	69.8466	86.2103	96.6878	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	51.8101	46.7963	51.8101	50.1389	51.8101	50.1389	51.8101	51.8101	50.1389	51.8101	50.1389	51.8101	(231)
Lighting	36.6415	29.3952	26.4671	19.3909	14.9781	12.2373	13.6635	17.7604	23.0690	30.2678	34.1874	37.6599	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-33.1246	-51.9604	-82.4700	-97.5946	-105.6422	-98.2912	-96.1020	-88.5158	-78.2179	-62.7439	-38.5182	-29.8985	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-9.2562	-22.3330	-50.9796	-84.2748	-114.0829	-121.8368	-116.8222	-94.7163	-70.0819	-36.0076	-13.6904	-8.0236	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												817.4063	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												279.7193	
Water heating fuel used												734.2340	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.3580)													
mechanical ventilation fans (SFP = 1.3580)												530.0227	(230a)
pump for solar water heating												80.0000	(230g)
Total electricity for the above, kWh/year												610.0227	(231)
Electricity for lighting (calculated in Appendix L)												295.7182	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1605.1846	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												852.1966	(238)

10a. Fuel costs - using BEDF prices (583)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	817.4063	28.4300	232.3886	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	734.2340	28.4300	208.7427	(247)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(247a)
Pumps, fans and electric keep-hot	530.0227	28.4300	150.6855	(249)
Pump for solar water heating	80.0000	28.4300	22.7440	(249)
Energy for lighting	295.7182	28.4300	84.0727	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-863.0793	28.4300	-245.3735	
PV Unit electricity exported	-742.1053	5.8100	-43.1163	
Total			-288.4898	(252)
Total energy cost			410.1437	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	817.4063	0.1550	126.6715	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	734.2340	0.1456	106.9246	(264)
Space and water heating			233.5961	(265)
Pumps, fans and electric keep-hot	610.0227	0.1387	84.6177	(267)

Energy for lighting	295.7182	0.1443	42.6813	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-863.0793	0.1337	-115.3732	
PV Unit electricity exported	-742.1053	0.1235	-91.6330	
Total			-207.0062	(269)
Total CO2, kg/year			153.8889	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	817.4063	1.5737	1286.3598	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	734.2340	1.5387	1129.7567	(278)
Space and water heating			2416.1164	(279)
Pumps, fans and electric keep-hot	610.0227	1.5128	922.8423	(281)
Energy for lighting	295.7182	1.5338	453.5824	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-863.0793	1.4940	-1289.4486	
PV Unit electricity exported	-742.1053	0.4532	-336.2972	
Total			-1625.7458	(283)
Total Primary energy kWh/year			2166.7954	(286)

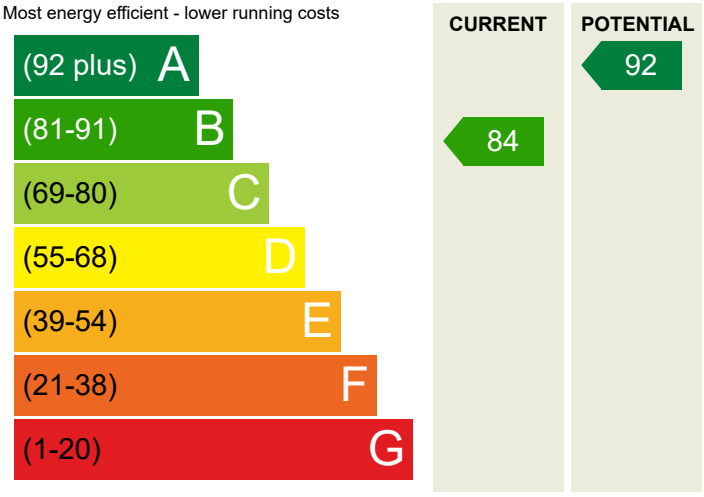
Energy Report

Dwelling Address	848 Rochdale Road, MANCHESTER, M9 8FA
Reference	78449-04-001
Assessment Date	02/07/2025
Submission Date	
Property Type	House, End-Terrace
Total Floor Area	120

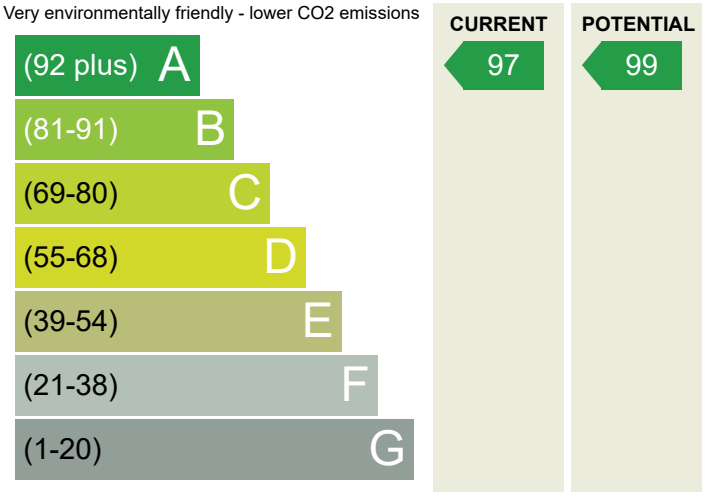
This Energy Report has been generated using the UK's National Calculation Methodology for dwellings, Standard Assessment Procedure (SAP). This methodology is used to assess the energy efficiency of dwellings which is calculated based on a dwelling's heating, hot water, ventilation and lighting usage.

This document is not an Energy Performance Certificate (EPC) as required by the Energy Performance of Buildings Regulations

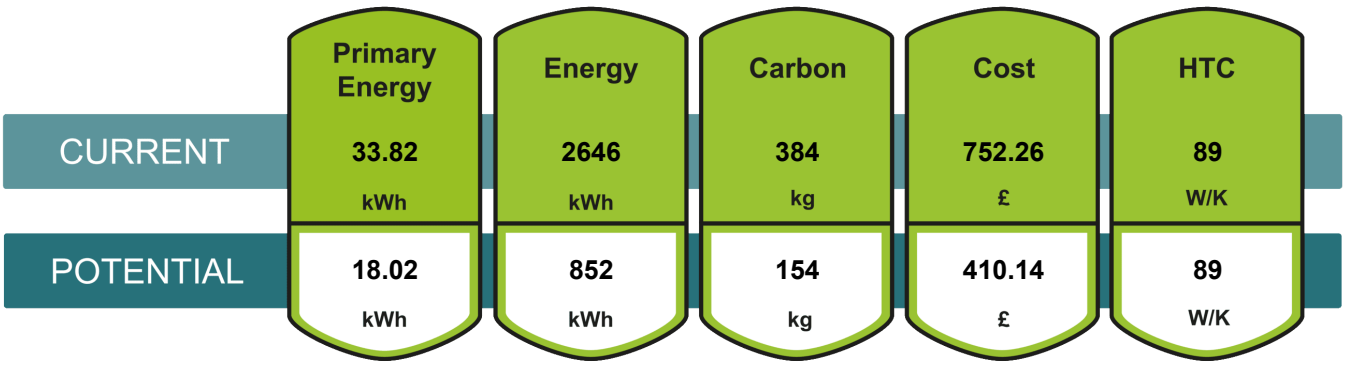
Energy Efficiency Rating



Carbon Dioxide (CO2) Emissions Rating



Additional ratings for your home



Energy Report

Breakdown of property's energy performance

Each feature is assessed as one of the following:

Very Poor | Poor | Average | Good | Very Good

Feature	Description	Energy Performance
Walls	Average thermal transmittance 0.13 W/m²K	Very Good
Roof	Average thermal transmittance 0.11 W/m²K	Very Good
Floor	Average thermal transmittance 0.09 W/m²K	Very Good
Windows	High performance glazing	Very Good
Main heating	Air source heat pump, radiators, electric	Good
Main heating controls	Programmer, room thermostat and TRVs	Good
Secondary heating	None	
Hot water	From main system	Good
Lighting	Good lighting efficiency	Good
Air tightness	Air permeability [AP50] = 5.0 m³/h.m² (as tested)	Good

Recommendations

The recommended measures provided below will help to improve the energy efficiency of the dwelling.
To reach the dwelling's potential energy rating all of the recommended measures shown below would need to be installed.
Having these measures installed individually or in any other order may give a different result when compared with the cumulative potential rating.

Recommended measures	Cumulative savings (per year)	Cumulative rating	Typical costs	Incremental savings (per year)	Cumulative CO2 rating
Solar water heating	£54	B 85	£4,000 - £7,000	£54	A 97
Photovoltaic	£342	A 92	£8,000 - £10,000	£288	A 99

Energy Report

The typical cost is based on average installation prices across the country so may not be representative of the actual costs in your area.

Estimated energy costs of the dwelling

The table below shows the estimated running costs of the space and water heating and lighting within the dwelling. It does not include the energy used from household appliances. The estimated annual costs after potential improvements indicates the total energy cost if all recommended measures named above were installed.

	Estimated annual costs	Estimated annual costs after potential improvements	Potential future savings
Lighting	£84	£84	
Heating	£380	£406	
Hot Water	£288	£209	
New Technologies e.g. Impact of PV	£0	-(£288)	
TOTAL	£752	£410	

Estimated energy use and potential savings

Space Heating
806
kWh per year

Water Heating
1014
kWh per year

Energy Report

About this document

Created by:	
Company/Trading name:	
Phone number:	
Email address:	

Disclaimer

This Energy Report should not under any circumstances be treated as a Condition Survey and cannot be used to indicate that any element of the dwelling (e.g.heating system) is working correctly.
This Energy Report must not be used in situations where an Energy Performance Certificate (EPC) is required.
This Energy Report is generated from a set of data inputs which may not reflect the actual dimensions, services or construction of the dwelling.
The calculation used to generate this report reflects the SAP Methodology current at the time of report generation.

Glossary terms for additional metrics

Primary Energy	The measure of the energy required for lighting, heating and hot water in a property. This includes the efficiency of the property's heating system, power station efficiency for electricity and the energy used to produce the fuel and deliver it to the property.
Energy Used	The estimated amount of fuel energy for lighting, heating and hot water for the property. The estimate is based on typical usage which is likely to be different to actual consumption.
Carbon (CO2)	The current emissions based on the energy estimates.
Cost	The estimated cost of energy. The cost of each unit of fuel is based on an industry standard which is likely to be different to those the occupier actually pays.
Heat Transfer Coefficient	Heat flow through the property envelope where internal and external temperatures are different.

Building Regulations England Part L (BREL) Compliance Report

Approved Document L1 2021 Edition, England assessed by Array SAP 10 program, Array

Date: Fri 03 Oct 2025 15:03:26

Project Information			
Assessed By	Paul Goddard	Building Type	House, End-terrace
OCDEA Registration	EES/005113	Assessment Date	2025-10-03

Dwelling Details			
Assessment Type	As built	Total Floor Area	120 m^2
Site Reference	78449-05	Plot Reference	001
Address	846 Rochdale Road, MANCHESTER, M9 8FA		

Client Details	
Name	-
Company	John Southworth
Address	Unit 10, Charles Street, DUKINFIELD, SK16 4SD

This report covers items included within the SAP calculations. It is not a complete report of regulations compliance.

1a Target emission rate and dwelling emission rate		
Fuel for main heating system	Electricity	
Target carbon dioxide emission rate	*10.91 $kgCO_2/m^2$*	
Dwelling carbon dioxide emission rate	3.36 $kgCO_2/m^2$	OK
1b Target primary energy rate and dwelling primary energy		
Target primary energy	*57.25 kWh_{PE}/m^2*	
Dwelling primary energy	35.54 kWh_{PE}/m^2	OK
1c Target fabric energy efficiency and dwelling fabric energy efficiency		
Target fabric energy efficiency	*39.2 kWh/m^2*	
Dwelling fabric energy efficiency	34.0 kWh/m^2	OK

2a Fabric U-values				
Element	***Maximum permitted average U-Value [W/m^2K]***	**Dwelling average U-Value [W/m^2K]**	**Element with highest individual U-Value**	
External walls	*0.26*	0.13	Walls (1) (0.13)	OK
Party walls	*0.2*	0	Party Wall (1) (0)	**N/A**
Curtain walls	*1.6*	0	N/A	**N/A**
Floors	*0.18*	0.09	Exposed Floor (0.14)	OK
Roofs	*0.16*	0.11	Roof (1) (0.13)	OK
Windows, doors, and roof windows	*1.6*	0.85	Front (1)	OK
Rooflights	*2.2*	N/A	N/A	**N/A**

2b Envelope elements (better than typically expected values are flagged with a subsequent (!))		
Name	**Net area [m^2]**	**U-Value [W/m^2K]**
Exposed wall: Walls (1)	120.97	0.13 **(!)**
Exposed wall: Walls (2)	16.77	0.09 **(!)**
Party wall: Party Wall (1)	40.63	0 **(!)**
Ground floor: GF, GF	47.06	0.09 **(!)**
Upper floor: Exposed Floor, Exposed Floor	2.72	0.14
Exposed roof: Roof (1)	15.51	0.13
Exposed roof: Roof (2)	12.23	0.13
Exposed roof: Roof (3)	26.38	0.09 **(!)**

2c Openings (better than typically expected values are flagged with a subsequent (!))				
Name	**Area [m^2]**	**Orientation**	**Frame factor**	**U-Value [W/m^2K]**
Front, Door	1.99	East	N/A	1 **(!)**
Front, Window	5.8	East	1.0	0.8 **(!)**
Rear, Window	2.81	West	1.0	0.8 **(!)**
Rear, Door	2.15	West	N/A	1 **(!)**
Side, Window	2.36	North	1.0	0.8 **(!)**

2d Thermal bridging (better than typically expected values are flagged with a subsequent (!))
Building part **1**: Thermal bridging calculated from linear thermal transmittances for each junction

Main element	Junction detail	Source	Psi value [W/mK]	Drawing / reference
External wall	E2: Other lintels (including other steel lintels)	Calculated by person with suitable expertise	0.115	Thermal Bridge Report
External wall	E3: Sill	Calculated by person with suitable expertise	0.017 **(!)**	Thermal Bridge Report
External wall	E4: Jamb	Calculated by person with suitable expertise	0.094	Thermal Bridge Report
External wall	E5: Ground floor (normal)	Calculated by person with suitable expertise	0.067	Thermal Bridge Report
External wall	E11: Eaves (insulation at rafter level)	Calculated by person with suitable expertise	0.025 **(!)**	Thermal Bridge Report
External wall	E16: Corner (normal)	Calculated by person with suitable expertise	0.068	Thermal Bridge Report
External wall	E12: Gable (insulation at ceiling level)	Calculated by person with suitable expertise	0.077	Thermal Bridge Report
External wall	E6: Intermediate floor within a dwelling	Calculated by person with suitable expertise	0.032 **(!)**	Thermal Bridge Report
External wall	E17: Corner (inverted - internal area greater than external area)	Calculated by person with suitable expertise	-0.029 **(!)**	Thermal Bridge Report
Party wall	P1: Ground floor	SAP table default	0.32	K1
External wall	E20: Exposed floor (normal)	Calculated by person with suitable expertise	0.079	Thermal Bridge Report
External wall	E21: Exposed floor (inverted)	Calculated by person with suitable expertise	0.063	Thermal Bridge Report
External wall	E13: Gable (insulation at rafter level)	Calculated by person with suitable expertise	0.074	Thermal Bridge Report
External wall	E18: Party wall between dwellings	Calculated by person with suitable expertise	0.092	Thermal Bridge Report
Roof	R6: Flat ceiling	Calculated by person with suitable expertise	-0.043	Thermal Bridge Report
External wall	E25: Staggered party wall between dwellings	Calculated by person with suitable expertise	0.056	Thermal Bridge Report

3 Air permeability (better than typically expected values are flagged with a subsequent (!))		
Maximum permitted air permeability at 50Pa	*8 m^3/hm^2*	
Dwelling air permeability at 50Pa	5 m^3/hm^2, Measured value	OK
Air permeability test certificate reference		

4 Space heating	
Main heating system 1: Heat pump with radiators or underfloor heating - Electricity	
Efficiency	281.4%
Emitter type	Radiators
Flow temperature	45°C
System type	
Manufacturer	Daikin Europe NV
Model	EDLA09DA3V3
Commissioning	
Secondary heating system: N/A	
Fuel	N/A
Efficiency	N/A
Commissioning	

5 Hot water	
Cylinder/store - type: Cylinder	
Capacity	210 litres
Declared heat loss	1.58 kWh/day
Primary pipework insulated	Yes
Manufacturer	
Model	
Commissioning	
Waste water heat recovery system 1 - type: N/A	
Efficiency	
Manufacturer	
Model	

6 Controls		
Main heating 1 - type: Programmer, room thermostat and TRVs		
Function		
Ecodesign class		
Manufacturer		
Model		
Water heating - type: Cylinder thermostat and HW separately timed		
Manufacturer		
Model		

7 Lighting		
Minimum permitted light source efficacy	*75 lm/W*	
Lowest light source efficacy	80 lm/W	OK
External lights control	N/A	

8 Mechanical ventilation		
System type: Balanced whole-house mechanical ventilation with heat recovery		
Maximum permitted specific fan power	*1.5 W/(l/s)*	
Specific fan power	0.97 W/(l/s)	OK
Minimum permitted heat recovery efficiency	*73%*	
Heat recovery efficiency	89%	OK
Manufacturer/Model	DV110 Adroit	
Commissioning		

9 Local generation
N/A

10 Heat networks
N/A

11 Supporting documentary evidence	
Documentary evidence identified in 11.1 and 11.2 is needed to confirm the data values used for any calculations undertaken, manufacturer declarations made, and tests performed as reflected in this "As built" BREL Compliance Report are correct. 11.1 SAP Conventions, Appendix 1 (documentary evidence) schedules the minimum documentary evidence required. 11.2 Indicative photographic evidence of key stages during construction (guidance within Approved Document L, Volume 1 – Appendix B) that confirms the products identified in this BREL Compliance Report are used in this dwelling, and workmanship is of sufficient quality to support the calculated values claimed in 2a to 2d.	

12 Declarations	
a. Assessor Declaration	
This declaration by the assessor is confirmation that the contents of this BREL Compliance Report are a true and accurate reflection based upon the design and construction information submitted for this dwelling for the purpose of carrying out the assessment, and that the supporting documentary evidence (identified in 11.1 and 11.2) pursuant to Part L of the Building Regulations 2010 (as amended) has been reviewed in the course of preparing this BREL Compliance Report.	
Signed: Name:	Assessor ID: Date:
b. Client Declaration	
This declaration by the client is confirmation that the dwelling has been constructed and completed according to the specifications set out in this BREL Compliance Report, and that photographic evidence of key stages, as described in 11.2, has been provided to the Assessor for this dwelling.	
Signed: Name:	Organisation: Date:

Full SAP Calculation Printout

Property Reference	78449-05	**Issued on Date**	03/10/2025
Assessment Reference	001	**Prop Type Ref**	End
Property	846 Rochdale Road, MANCHESTER, M9 8FA		

SAP Rating	84 B	**DER**	3.36	**TER**	10.91
Environmental	97 A	**% DER < TER**			69.20
CO_2 Emissions (t/year)	0.39	**DFEE**	34.01	**TFEE**	39.23
Compliance Check	See BREL	**% DFEE < TFEE**			13.31
% DPER < TPER	37.92	**DPER**	35.54	**TPER**	57.25

Assessor Details	Mr. Daniel Goddard	**Assessor ID**	CP52-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.0600 (1b)	x	2.4800 (2b)	=	116.7088	(1b) - (3b)
First floor	49.7800 (1c)	x	2.7800 (2c)	=	138.3884	(1c) - (3c)
Second floor	23.4000 (1d)	x	2.7700 (2d)	=	64.8180	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	120.2400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	319.9152	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.2500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2125	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2709	0.2656	0.2603	0.2338	0.2284	0.2019	0.2019	0.1966	0.2125	0.2284	0.2391	0.2497	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	80.1000 (23c)

Effective ac	0.3704	0.3651	0.3598	0.3332	0.3279	0.3014	0.3014	0.2961	0.3120	0.3279	0.3386	0.3492	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door			4.1400	1.0000	4.1400			(26)
Window			10.9700	0.7752	8.5039			(27)
GF			47.0600	0.0900	4.2354	75.0000	3529.5000	(28a)
Exposed Floor			2.7200	0.1400	0.3808	20.0000	54.4000	(28b)
Main	136.0800	15.1100	120.9700	0.1300	15.7261	9.0000	1088.7300	(29a)
Dwarf Wall (PIRx0.72)	16.7700		16.7700	0.0900	1.5093	9.0000	150.9300	(29a)
PIJ	15.5100		15.5100	0.1300	2.0163	9.0000	139.5900	(30)
PIR	12.2300		12.2300	0.1300	1.5899	9.0000	110.0700	(30)
Residual Ceiling	26.3800		26.3800	0.0900	2.3742	9.0000	237.4200	(30)
Total net area of external elements Aum(A, m2)			256.7500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		40.4759			(33)
Main dwelling								
Party Wall 1			40.6300	0.0000	0.0000	20.0000	812.6000	(32)

Timber	124.1700		9.0000	1117.5300 (32c)
FF	47.0600		18.0000	847.0800 (32d)
SF	23.4000		18.0000	421.2000 (32d)
GF	47.0600		9.0000	423.5400 (32e)
FF	23.4000		9.0000	210.6000 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 9143.1900 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 76.0412 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	10.6900	0.1150	1.2293
E3 Sill	10.6900	0.0170	0.1817
E4 Jamb	35.4000	0.0940	3.3276
E5 Ground floor (normal)	22.8600	0.0670	1.5316
E11 Eaves (insulation at rafter level)	18.1000	0.0250	0.4525
E16 Corner (normal)	29.0400	0.0680	1.9747
E12 Gable (insulation at ceiling level)	5.6600	0.0770	0.4358
E6 Intermediate floor within a dwelling	39.5500	0.0320	1.2656
E17 Corner (inverted - internal area greater than external area)	2.4800	-0.0290	-0.0719
P1 Party wall - Ground floor	6.2400	0.3200	1.9968
E20 Exposed floor (normal)	3.3800	0.0790	0.2670
E21 Exposed floor (inverted)	3.3800	0.0630	0.2129
E13 Gable (insulation at rafter level)	8.2800	0.0740	0.6127
E18 Party wall between dwellings	5.5600	0.0920	0.5115
R6 Flat ceiling	18.1000	-0.0430	-0.7783
E25 Staggered party wall between dwellings	4.9600	0.0560	0.2778

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 13.4275 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 53.9034 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	39.1078	38.5470	37.9861	35.1819	34.6210	31.8168	31.8168	31.2559	32.9385	34.6210	35.7427	36.8644	(38)
Heat transfer coeff	93.0112	92.4503	91.8895	89.0852	88.5244	85.7201	85.7201	85.1593	86.8418	88.5244	89.6461	90.7678	(39)

Average = Sum(39)m / 12 = 88.9450

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7735	0.7689	0.7642	0.7409	0.7362	0.7129	0.7129	0.7082	0.7222	0.7362	0.7456	0.7549	(40)
HLP (average)												0.7397	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.8642 (42)
Hot water usage for mixer showers

72.2437	71.1580	69.5759	66.5490	64.3151	61.8240	60.4080	61.9781	63.6992	66.3739	69.4659	71.9669	(42a)

Hot water usage for baths

31.1904	30.7271	30.0748	28.8721	27.9715	26.9729	26.4334	27.0812	27.7865	28.8550	30.0826	31.0849	(42b)

Hot water usage for other uses

43.9627	42.3640	40.7654	39.1667	37.5681	35.9694	35.9694	37.5681	39.1667	40.7654	42.3640	43.9627	(42c)

Average daily hot water use (litres/day) 135.4907 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	147.3967	144.2491	140.4161	134.5878	129.8547	124.7663	122.8109	126.6274	130.6524	135.9943	141.9125	147.0144	(44)
Energy conte	233.4403	205.4088	215.8143	184.2439	174.8094	153.4147	148.5292	156.7911	161.1075	184.5430	202.1803	230.1891	(45)
Energy content (annual)										Total = Sum(45)m =		2250.4717	
Distribution loss (46)m = 0.15 x (45)m	35.0160	30.8113	32.3722	27.6366	26.2214	23.0122	22.2794	23.5187	24.1661	27.6815	30.3271	34.5284	(46)
Water storage loss:													
Store volume												210.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5800	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8532	(55)
Total storage loss	26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(56)
If cylinder contains dedicated solar storage	26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	283.1519	250.3096	265.5259	232.3519	224.5210	201.5227	198.2408	206.5027	209.2155	234.2546	250.2883	279.9007	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	283.1519	250.3096	265.5259	232.3519	224.5210	201.5227	198.2408	206.5027	209.2155	234.2546	250.2883	279.9007	(64)
										Total per year (kWh/year) = Sum(64)m =		2835.7857	(64)
12Total per year (kWh/year)												2836	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	117.3882	104.2191	111.5276	99.7475	97.8934	89.4968	89.1552	91.9023	92.0546	101.1298	105.7114	116.3071	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	173.9086	192.5416	173.9086	179.7055	173.9086	179.7055	173.9086	173.9086	179.7055	173.9086	179.7055	173.9086	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	285.5253	288.4881	281.0218	265.1269	245.0625	226.2048	213.6066	210.6438	218.1101	234.0050	254.0694	272.9272	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	(71)
Water heating gains (Table 5)	157.7798	155.0879	149.9026	138.5382	131.5771	124.3011	119.8323	123.5246	127.8537	135.9272	146.8213	156.3268	(72)
Total internal gains	683.1772	702.0812	670.7966	649.3342	616.5118	596.1749	573.3110	574.0405	591.6328	609.8043	646.5598	669.1261	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	2.3600	10.6334	0.3000	0.0000	0.7700	5.7969	(74)
East	5.8000	19.6403	0.3000	0.0000	0.7700	26.3140	(76)
West	2.8100	19.6403	0.3000	0.0000	0.7700	12.7487	(80)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	44.8596	87.4931	144.6691	213.7738	265.6632	273.8620	259.9249	220.6005	168.9956	103.8599	55.8578	36.9559	(83)
Total gains	728.0368	789.5744	815.4657	863.1080	882.1750	870.0369	833.2359	794.6410	760.6284	713.6642	702.4177	706.0819	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	27.3061	27.4718	27.6395	28.5095	28.6901	29.6287	29.6287	29.8238	29.2460	28.6901	28.3311	27.9810	
alpha	2.8204	2.8315	2.8426	2.9006	2.9127	2.9752	2.9752	2.9883	2.9497	2.9127	2.8887	2.8654	
util living area	0.9336	0.9145	0.8867	0.8196	0.7182	0.5602	0.4282	0.4609	0.6522	0.8303	0.9067	0.9377	(86)
Living	18.9578	19.2043	19.5692	20.1200	20.5484	20.8527	20.9509	20.9384	20.7529	20.2190	19.5564	18.9648	
Non living	18.3802	18.6250	18.9859	19.5334	19.9390	20.2247	20.3014	20.2970	20.1367	19.6374	18.9885	18.3985	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	19.9553	19.2043	19.5692	20.1200	20.5484	20.8527	20.9509	20.9384	20.7529	20.2190	19.5564	19.2495	(87)
Th 2	20.2763	20.2804	20.2845	20.3048	20.3089	20.3294	20.3294	20.3336	20.3212	20.3089	20.3008	20.2926	(88)
util rest of house	0.9270	0.9061	0.8751	0.8008	0.6877	0.5145	0.3697	0.4025	0.6091	0.8090	0.8963	0.9315	(89)
MIT 2	19.3063	18.6250	18.9859	19.5334	19.9390	20.2247	20.3014	20.2970	20.1367	19.6374	18.9885	18.6635	(90)
Living area fraction									fLA = Living area / (4) =			0.2917	(91)
MIT	19.4957	18.7940	19.1560	19.7046	20.1168	20.4079	20.4909	20.4841	20.3165	19.8071	19.1542	18.8344	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4957	18.7940	19.1560	19.7046	20.1168	20.4079	20.4909	20.4841	20.3165	19.8071	19.1542	18.8344	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9189	0.8850	0.8537	0.7827	0.6786	0.5200	0.3841	0.4160	0.6087	0.7916	0.8759	0.9161	(94)
Useful gains	669.0002	698.8081	696.1251	675.5183	598.6846	452.4620	320.0504	330.6073	463.0195	564.9185	615.2614	646.8454	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1413.3668	1284.5031	1162.9577	962.5259	745.0931	497.8563	333.5266	347.8027	539.8497	815.0512	1080.6086	1328.3361	(97)
Space heating kWh	553.8087	393.5870	347.3234	206.6455	108.9279	0.0000	0.0000	0.0000	0.0000	186.0987	335.0500	507.0290	(98a)
Space heating requirement - total per year (kWh/year)												2638.4703	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	553.8087	393.5870	347.3234	206.6455	108.9279	0.0000	0.0000	0.0000	0.0000	186.0987	335.0500	507.0290	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2638.4703	
Space heating per m2											(98c) / (4) =	21.9434	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Efficiency of main space heating system 1 (in %)	281.3941 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	553.8087	393.5870	347.3234	206.6455	108.9279	0.0000	0.0000	0.0000	0.0000	186.0987	335.0500	507.0290	(98)
Space heating efficiency (main heating system 1)	281.3941	281.3941	281.3941	281.3941	281.3941	0.0000	0.0000	0.0000	0.0000	281.3941	281.3941	281.3941	(210)
Space heating fuel (main heating system)	196.8089	139.8704	123.4295	73.4363	38.7101	0.0000	0.0000	0.0000	0.0000	66.1346	119.0679	180.1847	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	283.1519	250.3096	265.5259	232.3519	224.5210	201.5227	198.2408	206.5027	209.2155	234.2546	250.2883	279.9007	(64)
Efficiency of water heater												279.7109	(216)
(217)m	279.7109	279.7109	279.7109	279.7109	279.7109	279.7109	279.7109	279.7109	279.7109	279.7109	279.7109	279.7109	(217)
Fuel for water heating, kWh/month	101.2302	89.4887	94.9287	83.0686	80.2689	72.0468	70.8734	73.8272	74.7970	83.7488	89.4811	100.0678	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	45.0156	40.6593	45.0156	43.5635	45.0156	43.5635	45.0156	45.0156	43.5635	45.0156	43.5635	45.0156	(231)
Lighting	36.6415	29.3952	26.4671	19.3909	14.9781	12.2373	13.6635	17.7604	23.0690	30.2678	34.1874	37.6599	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	937.6424	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	279.7109	
Water heating fuel used	1013.8274	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.3580)		
mechanical ventilation fans (SFP = 1.3580)	530.0227	(230a)
Total electricity for the above, kWh/year	530.0227	(231)
Electricity for lighting (calculated in Appendix L)	295.7182	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2777.2107	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	937.6424	0.1550	145.2986	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1013.8274	0.1410	142.9361	(264)
Space and water heating			288.2347	(265)
Pumps, fans and electric keep-hot	530.0227	0.1387	73.5207	(267)
Energy for lighting	295.7182	0.1443	42.6813	(268)
Total CO2, kg/year			404.4367	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.3600	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	937.6424	1.5737	1475.5489	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1013.8274	1.5213	1542.3577	(278)
Space and water heating			3017.9066	(279)
Pumps, fans and electric keep-hot	530.0227	1.5128	801.8183	(281)
Energy for lighting	295.7182	1.5338	453.5824	(282)
Total Primary energy kWh/year			4273.3074	(286)
Dwelling Primary energy Rate (DPER)			35.5400	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.0600 (1b)	x	2.4800 (2b)	=	116.7088	(1b) - (3b)
First floor	49.7800 (1c)	x	2.7800 (2c)	=	138.3884	(1c) - (3c)
Second floor	23.4000 (1d)	x	2.7700 (2d)	=	64.8180	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	120.2400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	319.9152	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	4 * 10 =	40.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1250	(8)
Pressure test		Yes	

Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.3750	(18)
Number of sides sheltered	2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3188	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4064	0.3985	0.3905	0.3507	0.3427	0.3028	0.3028	0.2949	0.3188	0.3427	0.3586	0.3746	(22b)
Effective ac	0.5826	0.5794	0.5762	0.5615	0.5587	0.5459	0.5459	0.5435	0.5508	0.5587	0.5643	0.5701	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			4.1400	1.0000	4.1400			(26)
TER Opening Type			10.9700	1.1450	12.5611			(27)
GF			47.0600	0.1300	6.1178			(28a)
Exposed Floor			2.7200	0.1300	0.3536			(28b)
Main	136.0800	15.1100	120.9700	0.1800	21.7746			(29a)
Dwarf Wall (PIRx0.72)	16.7700		16.7700	0.1800	3.0186			(29a)
PIJ	15.5100		15.5100	0.1100	1.7061			(30)
PIR	12.2300		12.2300	0.1100	1.3453			(30)
Residual Ceiling	26.3800		26.3800	0.1100	2.9018			(30)
Total net area of external elements Aum(A, m2)			256.7500					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	53.9189			(33)
Main dwelling								
Party Wall 1			40.6300	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	76.0412	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	10.6900	0.0500	0.5345
E3 Sill	10.6900	0.0500	0.5345
E4 Jamb	35.4000	0.0500	1.7700
E5 Ground floor (normal)	22.8600	0.1600	3.6576
E11 Eaves (insulation at rafter level)	18.1000	0.0400	0.7240
E16 Corner (normal)	29.0400	0.0900	2.6136
E12 Gable (insulation at ceiling level)	5.6600	0.0600	0.3396
E6 Intermediate floor within a dwelling	39.5500	0.0000	0.0000
E17 Corner (inverted - internal area greater than external area)	2.4800	-0.0900	-0.2232
P1 Party wall - Ground floor	6.2400	0.0800	0.4992
E20 Exposed floor (normal)	3.3800	0.3200	1.0816
E21 Exposed floor (inverted)	3.3800	0.3200	1.0816
E13 Gable (insulation at rafter level)	8.2800	0.0800	0.6624
E18 Party wall between dwellings	5.5600	0.0600	0.3336
R6 Flat ceiling	18.1000	0.0600	1.0860
E25 Staggered party wall between dwellings	4.9600	0.0600	0.2976

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	14.9926	(36)
Point Thermal bridges	(36a) = 0.0000	
Total fabric heat loss	(33) + (36) + (36a) = 68.9115	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	61.5060	61.1674	60.8355	59.2766	58.9849	57.6271	57.6271	57.3757	58.1501	58.9849	59.5749	60.1918	(38)
Heat transfer coeff	130.4175	130.0789	129.7470	128.1880	127.8964	126.5386	126.5386	126.2871	127.0616	127.8964	128.4864	129.1033	(39)
Average = Sum(39)m / 12 =												128.1866	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0846	1.0818	1.0791	1.0661	1.0637	1.0524	1.0524	1.0503	1.0567	1.0637	1.0686	1.0737	(40)
HLP (average)												1.0661	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.8642	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
72.2437	71.1580	69.5759	66.5490	64.3151	61.8240	60.4080	61.9781	63.6992	66.3739	69.4659	71.9669	(42a)

Hot water usage for baths

31.1904	30.7271	30.0748	28.8721	27.9715	26.9729	26.4334	27.0812	27.7865	28.8550	30.0826	31.0849	(42b)

Hot water usage for other uses

43.9627	42.3640	40.7654	39.1667	37.5681	35.9694	35.9694	37.5681	39.1667	40.7654	42.3640	43.9627	(42c)

Average daily hot water use (litres/day)	135.4907	(43)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use												
147.3967	144.2491	140.4161	134.5878	129.8547	124.7663	122.8109	126.6274	130.6524	135.9943	141.9125	147.0144	(44)
Energy conte 233.4403	205.4088	215.8143	184.2439	174.8094	153.4147	148.5292	156.7911	161.1075	184.5430	202.1803	230.1891	(45)
Energy content (annual)										Total = Sum(45)m =		2250.4717	
Distribution loss (46)m = 0.15 x (45)m													
35.0160	30.8113	32.3722	27.6366	26.2214	23.0122	22.2794	23.5187	24.1661	27.6815	30.3271	34.5284	(46)

Water storage loss:		
Store volume	210.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):	1.7016	(48)
Temperature factor from Table 2b	0.5400	(49)
Enter (49) or (54) in (55)	0.9188	(55)

Total storage loss

28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842	(56)

If cylinder contains dedicated solar storage

28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

285.1869	252.1477	267.5609	234.3213	226.5560	203.4920	200.2757	208.5377	211.1848	236.2896	252.2577	281.9357	(62)
WWHRS -33.0268	-29.2092	-30.5861	-25.3265	-23.6034	-20.1976	-18.9320	-20.1323	-20.8972	-24.6355	-27.9091	-32.4152	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

	252.1601	222.9385	236.9748	208.9947	202.9525	183.2944	181.3437	188.4054	190.2876	211.6541	224.3486	249.5205 (64)
										Total per year (kWh/year) = Sum(64)m =		2552.8750 (64)
12Total per year (kWh/year)												2553 (64)

Electric shower(s)

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000 (64a)

Heat gains from water heating, kWh/month

	119.0162	105.6895	113.1555	101.3230	99.5214	91.0723	90.7832	93.5303	93.6301	102.7578	107.2868	117.9351 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	169.4681	187.6254	169.4681	175.1171	169.4681	175.1171	169.4681	169.4681	175.1171	169.4681	175.1171	169.4681	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	285.5253	288.4881	281.0218	265.1269	245.0625	226.2048	213.6066	210.6438	218.1101	234.0050	254.0694	272.9272	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	(71)

Water heating gains (Table 5)

	159.9680	157.2761	152.0908	140.7264	133.7653	126.4893	122.0205	125.7128	130.0418	138.1154	149.0095	158.5150	(72)

Total internal gains

	683.9250	702.3532	671.5443	649.9339	617.2595	593.7747	571.0588	571.7883	589.2325	610.5520	647.1595	669.8738	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	2.3600	10.6334	0.6300	0.7000	0.7700	7.6693	(74)
East	5.8000	19.6403	0.6300	0.7000	0.7700	34.8135	(76)
West	2.8100	19.6403	0.6300	0.7000	0.7700	16.8665	(80)

Solar gains	59.3493	115.7534	191.3972	282.8227	351.4725	362.3194	343.8806	291.8544	223.5812	137.4067	73.8999	48.8926	(83)
Total gains	743.2742	818.1066	862.9415	932.7567	968.7320	956.0940	914.9394	863.6427	812.8137	747.9587	721.0595	718.7664	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	19.4742	19.5249	19.5748	19.8129	19.8581	20.0712	20.0712	20.1111	19.9885	19.8581	19.7669	19.6724	
alpha	2.2983	2.3017	2.3050	2.3209	2.3239	2.3381	2.3381	2.3407	2.3326	2.3239	2.3178	2.3115	
util living area													
	0.9427	0.9267	0.9028	0.8498	0.7671	0.6405	0.5164	0.5541	0.7259	0.8653	0.9234	0.9466	(86)
MIT	17.9931	18.2772	18.7513	19.4443	20.0836	20.5925	20.8261	20.7886	20.4097	19.5977	18.7047	17.9563	(87)
Th 2	20.0134	20.0157	20.0180	20.0286	20.0306	20.0399	20.0399	20.0416	20.0363	20.0306	20.0266	20.0224	(88)
util rest of house													
	0.9358	0.9179	0.8904	0.8292	0.7317	0.5796	0.4278	0.4677	0.6734	0.8427	0.9127	0.9402	(89)
MIT 2	16.4781	16.8381	17.4382	18.3096	19.0909	19.6845	19.9238	19.8932	19.4895	18.5135	17.3900	16.4360	(90)
Living area fraction									fLA = Living area / (4) =			0.2917	(91)
MIT	16.9201	17.2580	17.8213	18.6407	19.3805	19.9494	20.1871	20.1545	19.7579	18.8298	17.7736	16.8796	(92)
Temperature adjustment												0.0000	
adjusted MIT	16.9201	17.2580	17.8213	18.6407	19.3805	19.9494	20.1871	20.1545	19.7579	18.8298	17.7736	16.8796	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9049	0.8838	0.8537	0.7928	0.7040	0.5732	0.4424	0.4787	0.6559	0.8073	0.8788	0.9104	(94)
Useful gains	672.5564	723.0074	736.7218	739.4614	681.9830	548.0586	404.7522	413.4073	533.1442	603.7944	633.6402	654.4001	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1645.8803	1607.5120	1468.9036	1248.6379	982.3070	676.9086	453.9013	474.1390	718.9052	1052.5640	1371.4077	1636.9720	(97)
Space heating kWh													
	724.1530	594.3871	544.7432	366.6071	223.4411	0.0000	0.0000	0.0000	0.0000	333.8846	531.1926	731.0335	(98a)
Space heating requirement - total per year (kWh/year)												4049.4422	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	724.1530	594.3871	544.7432	366.6071	223.4411	0.0000	0.0000	0.0000	0.0000	333.8846	531.1926	731.0335	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4049.4422	
Space heating per m2											(98c) / (4) =	33.6780	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	724.1530	594.3871	544.7432	366.6071	223.4411	0.0000	0.0000	0.0000	0.0000	333.8846	531.1926	731.0335	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)

Space heating fuel (main heating system)

	784.5644	643.9731	590.1877	397.1908	242.0813	0.0000	0.0000	0.0000	0.0000	361.7384	575.5066	792.0190 (211)

Space heating efficiency (main heating system 2)

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)

Space heating fuel (main heating system 2)

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)

Space heating fuel (secondary)

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)

Water heating

Water heating requirement

	252.1601	222.9385	236.9748	208.9947	202.9525	183.2944	181.3437	188.4054	190.2876	211.6541	224.3486	249.5205 (64)

Efficiency of water heater

												79.8000 (216)
(217)m	86.2866	86.1498	85.8643	85.3067	84.2760	79.8000	79.8000	79.8000	79.8000	85.0773	85.9225	86.3226 (217)

Fuel for water heating, kWh/month

	292.2357	258.7802	275.9874	244.9922	240.8190	229.6923	227.2477	236.0970	238.4556	248.7785	261.1057	289.0559 (219)

Space cooling fuel requirement

(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	35.2121	28.2485	25.4346	18.6345	14.3938	11.7599	13.1305	17.0676	22.1691	29.0870	32.8537	36.1908 (232)

Electricity generated by PVs (Appendix M) (negative quantity)

(233a)m	-44.8072	-63.5497	-91.8382	-103.7677	-112.2423	-104.8160	-103.4928	-97.5518	-87.0985	-72.9046	-49.3875	-38.6916 (233a)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)

Electricity generated by PVs (Appendix M) (negative quantity)

(233b)m	-24.0979	-50.8552	-101.4085	-152.8048	-202.5583	-203.7721	-201.4037	-170.3034	-124.5108	-72.9191	-32.2313	-19.0454 (233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year

Space heating fuel - main system 1	4387.2614 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	79.8000
Water heating fuel used	3043.2471 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
Total electricity for the above, kWh/year	86.0000 (231)
Electricity for lighting (calculated in Appendix L)	284.1821 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-2326.0585 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	5474.6321 (238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	4387.2614	0.2100	921.3249	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3043.2471	0.2100	639.0819	(264)
Space and water heating			1560.4068	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	284.1821	0.1443	41.0163	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-970.1480	0.1345	-130.4743	
PV Unit electricity exported	-1355.9105	0.1258	-170.5666	
Total			-301.0408	(269)
Total CO2, kg/year			1312.3115	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.9100	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	4387.2614	1.1300	4957.6053	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3043.2471	1.1300	3438.8693	(278)
Space and water heating			8396.4746	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	284.1821	1.5338	435.8880	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-970.1480	1.4970	-1452.3538	
PV Unit electricity exported	-1355.9105	0.4617	-626.0894	
Total			-2078.4431	(283)
Total Primary energy kWh/year			6884.0203	(286)
Target Primary Energy Rate (TPER)			57.2500	(287)

Full SAP Calculation Printout

Property Reference	78449-05	**Issued on Date**	03/10/2025
Assessment Reference	001	**Prop Type Ref**	End
Property	846 Rochdale Road, MANCHESTER, M9 8FA		

SAP Rating	84 B	**DER**	3.36	**TER**	10.91
Environmental	97 A	**% DER < TER**			69.20
CO_2 Emissions (t/year)	0.39	**DFEE**	34.01	**TFEE**	39.23
Compliance Check	See BREL	**% DFEE < TFEE**			13.31
% DPER < TPER	37.92	**DPER**	35.54	**TPER**	57.25

Assessor Details	Mr. Daniel Goddard	**Assessor ID**	CP52-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.0600 (1b)	x	2.4800 (2b)	=	116.7088	(1b) - (3b)
First floor	49.7800 (1c)	x	2.7800 (2c)	=	138.3884	(1c) - (3c)
Second floor	23.4000 (1d)	x	2.7700 (2d)	=	64.8180	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	120.2400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	319.9152	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	4 * 10 =	40.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1250	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3750	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3188	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4064	0.3985	0.3905	0.3507	0.3427	0.3028	0.3028	0.2949	0.3188	0.3427	0.3586	0.3746	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5826	0.5794	0.5762	0.5615	0.5587	0.5459	0.5459	0.5435	0.5508	0.5587	0.5643	0.5701	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door			4.1400	1.0000	4.1400			(26)
Window			10.9700	0.7752	8.5039			(27)
GF			47.0600	0.0900	4.2354	75.0000	3529.5000	(28a)
Exposed Floor			2.7200	0.1400	0.3808	20.0000	54.4000	(28b)
Main	136.0800	15.1100	120.9700	0.1300	15.7261	9.0000	1088.7300	(29a)
Dwarf Wall (PIRx0.72)	16.7700		16.7700	0.0900	1.5093	9.0000	150.9300	(29a)
PIJ	15.5100		15.5100	0.1300	2.0163	9.0000	139.5900	(30)
PIR	12.2300		12.2300	0.1300	1.5899	9.0000	110.0700	(30)
Residual Ceiling	26.3800		26.3800	0.0900	2.3742	9.0000	237.4200	(30)
Total net area of external elements Aum(A, m2)			256.7500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		40.4759			(33)
Main dwelling								
Party Wall 1			40.6300	0.0000	0.0000	20.0000	812.6000	(32)
Timber			124.1700			9.0000	1117.5300	(32c)
FF			47.0600			18.0000	847.0800	(32d)
SF			23.4000			18.0000	421.2000	(32d)

GF	47.0600		9.0000	423.5400 (32e)
FF	23.4000		9.0000	210.6000 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 9143.1900 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 76.0412 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	10.6900	0.1150	1.2293
E3 Sill	10.6900	0.0170	0.1817
E4 Jamb	35.4000	0.0940	3.3276
E5 Ground floor (normal)	22.8600	0.0670	1.5316
E11 Eaves (insulation at rafter level)	18.1000	0.0250	0.4525
E16 Corner (normal)	29.0400	0.0680	1.9747
E12 Gable (insulation at ceiling level)	5.6600	0.0770	0.4358
E6 Intermediate floor within a dwelling	39.5500	0.0320	1.2656
E17 Corner (inverted - internal area greater than external area)	2.4800	-0.0290	-0.0719
P1 Party wall - Ground floor	6.2400	0.3200	1.9968
E20 Exposed floor (normal)	3.3800	0.0790	0.2670
E21 Exposed floor (inverted)	3.3800	0.0630	0.2129
E13 Gable (insulation at rafter level)	8.2800	0.0740	0.6127
E18 Party wall between dwellings	5.5600	0.0920	0.5115
R6 Flat ceiling	18.1000	-0.0430	-0.7783
E25 Staggered party wall between dwellings	4.9600	0.0560	0.2778

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 13.4275 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 53.9034 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	61.5060	61.1674	60.8355	59.2766	58.9849	57.6271	57.6271	57.3757	58.1501	58.9849	59.5749	60.1918	(38)
Heat transfer coeff	115.4094	115.0708	114.7388	113.1799	112.8882	111.5305	111.5305	111.2790	112.0535	112.8882	113.4783	114.0952	(39)
Average = Sum(39)m / 12 =												113.1785	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9598	0.9570	0.9542	0.9413	0.9389	0.9276	0.9276	0.9255	0.9319	0.9389	0.9438	0.9489	(40)
HLP (average)												0.9413	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.8642 (42)
Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

31.1904	30.7271	30.0748	28.8721	27.9715	26.9729	26.4334	27.0812	27.7865	28.8550	30.0826	31.0849	(42b)

Hot water usage for other uses

43.9627	42.3640	40.7654	39.1667	37.5681	35.9694	35.9694	37.5681	39.1667	40.7654	42.3640	43.9627	(42c)

Average daily hot water use (litres/day) 68.8844 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	75.1530	73.0911	70.8402	68.0388	65.5396	62.9423	62.4029	64.6493	66.9532	69.6204	72.4466	75.0476	(44)
Energy conte	119.0240	104.0808	108.8787	93.1417	88.2288	77.3949	75.4709	80.0493	82.5600	94.4742	103.2134	117.5064	(45)

Energy content (annual) Total = Sum(45)m = 1144.0232
Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss:
Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

101.1704	88.4687	92.5469	79.1705	74.9945	65.7857	64.1503	68.0419	70.1760	80.3031	87.7314	99.8804	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

101.1704	88.4687	92.5469	79.1705	74.9945	65.7857	64.1503	68.0419	70.1760	80.3031	87.7314	99.8804	(64)

Total per year (kWh/year) = Sum(64)m = 972.4197 (64)
12Total per year (kWh/year) 972 (64)
Electric shower(s)

57.8551	51.5494	56.2900	53.7168	54.7248	52.2022	53.9422	54.7248	53.7168	56.2900	55.2315	57.8551	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 658.0987 (64a)
Heat gains from water heating, kWh/month

39.7564	35.0045	37.2092	33.2218	32.4298	29.4970	29.5231	30.6917	30.9732	34.1483	35.7407	39.4339	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	173.9086	192.5416	173.9086	179.7055	173.9086	179.7055	173.9086	173.9086	179.7055	173.9086	179.7055	173.9086	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	285.5253	288.4881	281.0218	265.1269	245.0625	226.2048	213.6066	210.6438	218.1101	234.0050	254.0694	272.9272	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	(71)
Water heating gains (Table 5)	53.4360	52.0901	50.0124	46.1414	43.5885	40.9680	39.6816	41.2523	43.0183	45.8982	49.6399	53.0025	(72)
Total internal gains	578.8334	599.0834	570.9064	556.9374	528.5231	512.8418	493.1604	491.7682	506.7975	519.7753	549.3784	565.8018	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	2.3600	10.6334	0.3000	0.0000	0.7700	5.7969	(74)
East	5.8000	19.6403	0.3000	0.0000	0.7700	26.3140	(76)
West	2.8100	19.6403	0.3000	0.0000	0.7700	12.7487	(80)

Solar gains	44.8596	87.4931	144.6691	213.7738	265.6632	273.8620	259.9249	220.6005	168.9956	103.8599	55.8578	36.9559	(83)
Total gains	623.6930	686.5765	715.5754	770.7112	794.1864	786.7038	753.0852	712.3686	675.7931	623.6352	605.2362	602.7577	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	22.0067	22.0714	22.1353	22.4402	22.4981	22.7720	22.7720	22.8235	22.6657	22.4981	22.3812	22.2601	
alpha	2.4671	2.4714	2.4757	2.4960	2.4999	2.5181	2.5181	2.5216	2.5110	2.4999	2.4921	2.4840	
util living area	0.9573	0.9441	0.9255	0.8798	0.8056	0.6802	0.5524	0.5908	0.7615	0.8918	0.9413	0.9606	(86)
MIT	18.1442	18.4110	18.8447	19.5034	20.1115	20.6108	20.8373	20.8016	20.4381	19.6612	18.8214	18.1141	(87)
Th 2	20.1169	20.1193	20.1216	20.1326	20.1346	20.1441	20.1441	20.1459	20.1405	20.1346	20.1305	20.1261	(88)
util rest of house	0.9523	0.9375	0.9161	0.8633	0.7757	0.6255	0.4700	0.5111	0.7157	0.8738	0.9333	0.9560	(89)
MIT 2	17.4732	17.7385	18.1688	18.8211	19.4064	19.8691	20.0541	20.0309	19.7206	18.9832	18.1547	17.4493	(90)
Living area fraction										fLA = Living area / (4) =		0.2917	(91)
MIT	17.6689	17.9347	18.3660	19.0202	19.6121	20.0855	20.2826	20.2557	19.9300	19.1810	18.3492	17.6433	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.6689	17.9347	18.3660	19.0202	19.6121	20.0855	20.2826	20.2557	19.9300	19.1810	18.3492	17.6433	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9333	0.9158	0.8919	0.8377	0.7549	0.6213	0.4843	0.5222	0.7030	0.8493	0.9116	0.9380	(94)
Useful gains	582.1235	628.7714	638.2509	645.6165	599.5170	488.8086	364.7041	371.9676	475.0564	529.6289	551.7298	565.3586	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1542.9018	1499.9113	1361.4918	1145.4002	893.1799	611.8021	410.7254	429.0626	653.2665	968.6937	1276.5456	1533.8146	(97)
Space heating kWh	714.8190	585.4060	538.0912	359.8443	218.4852	0.0000	0.0000	0.0000	0.0000	326.6642	521.8674	720.5312	(98a)
Space heating requirement - total per year (kWh/year)												3985.7085	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	714.8190	585.4060	538.0912	359.8443	218.4852	0.0000	0.0000	0.0000	0.0000	326.6642	521.8674	720.5312	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3985.7085	
Space heating per m2											(98c) / (4) =	33.1479	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	1048.3863	825.3254	845.7205	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.6265	0.7004	0.6704	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	656.8097	578.0877	567.0113	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	826.2361	791.0819	747.1967	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	121.9870	158.4677	134.0579	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	30.4968	39.6169	33.5145	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												103.6282	(107)
Energy for space heating												33.1479	(99)
Energy for space cooling												0.8618	(108)
Total												34.0098	(109)
Fabric Energy Efficiency (DFEE)												34.0	(109)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.0600 (1b)	x	2.4800 (2b)	=	116.7088	(1b) - (3b)
First floor	49.7800 (1c)	x	2.7800 (2c)	=	138.3884	(1c) - (3c)
Second floor	23.4000 (1d)	x	2.7700 (2d)	=	64.8180	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	120.2400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	319.9152	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	4 * 10 =	40.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1250	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3750	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3188	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4064	0.3985	0.3905	0.3507	0.3427	0.3028	0.3028	0.2949	0.3188	0.3427	0.3586	0.3746	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0.0000	(23c)
Effective ac	0.5701	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			4.1400	1.0000	4.1400			(26)
TER Opening Type			10.9700	1.1450	12.5611			(27)
GF			47.0600	0.1300	6.1178			(28a)
Exposed Floor			2.7200	0.1300	0.3536			(28b)
Main	136.0800	15.1100	120.9700	0.1800	21.7746			(29a)
Dwarf Wall (PIRx0.72)	16.7700		16.7700	0.1800	3.0186			(29a)
PIJ	15.5100		15.5100	0.1100	1.7061			(30)
PIR	12.2300		12.2300	0.1100	1.3453			(30)
Residual Ceiling	26.3800		26.3800	0.1100	2.9018			(30)
Total net area of external elements Aum(A, m2)			256.7500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		53.9189			(33)
Main dwelling								
Party Wall 1			40.6300	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	76.0412	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	10.6900	0.0500	0.5345
E3 Sill	10.6900	0.0500	0.5345
E4 Jamb	35.4000	0.0500	1.7700
E5 Ground floor (normal)	22.8600	0.1600	3.6576
E11 Eaves (insulation at rafter level)	18.1000	0.0400	0.7240
E16 Corner (normal)	29.0400	0.0900	2.6136
E12 Gable (insulation at ceiling level)	5.6600	0.0600	0.3396
E6 Intermediate floor within a dwelling	39.5500	0.0000	0.0000
E17 Corner (inverted - internal area greater than external area)	2.4800	-0.0900	-0.2232
P1 Party wall - Ground floor	6.2400	0.0800	0.4992
E20 Exposed floor (normal)	3.3800	0.3200	1.0816
E21 Exposed floor (inverted)	3.3800	0.3200	1.0816
E13 Gable (insulation at rafter level)	8.2800	0.0800	0.6624
E18 Party wall between dwellings	5.5600	0.0600	0.3336
R6 Flat ceiling	18.1000	0.0600	1.0860
E25 Staggered party wall between dwellings	4.9600	0.0600	0.2976

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		14.9926	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	68.9115	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	61.5060	61.1674	60.8355	59.2766	58.9849	57.6271	57.6271	57.3757	58.1501	58.9849	59.5749	60.1918	(38)
Heat transfer coeff	130.4175	130.0789	129.7470	128.1880	127.8964	126.5386	126.5386	126.2871	127.0616	127.8964	128.4864	129.1033	(39)
Average = Sum(39)m / 12 =												128.1866	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0846	1.0818	1.0791	1.0661	1.0637	1.0524	1.0524	1.0503	1.0567	1.0637	1.0686	1.0737	(40)
HLP (average)												1.0661	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.8642	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

31.1904	30.7271	30.0748	28.8721	27.9715	26.9729	26.4334	27.0812	27.7865	28.8550	30.0826	31.0849	(42b)

Hot water usage for other uses

43.9627	42.3640	40.7654	39.1667	37.5681	35.9694	35.9694	37.5681	39.1667	40.7654	42.3640	43.9627	(42c)

Average daily hot water use (litres/day)	68.8844 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	75.1530	73.0911	70.8402	68.0388	65.5396	62.9423	62.4029	64.6493	66.9532	69.6204	72.4466	75.0476	(44)
Energy conte	119.0240	104.0808	108.8787	93.1417	88.2288	77.3949	75.4709	80.0493	82.5600	94.4742	103.2134	117.5064	(45)

Energy content (annual) Total = Sum(45)m = 1144.0232
Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss:
Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

101.1704	88.4687	92.5469	79.1705	74.9945	65.7857	64.1503	68.0419	70.1760	80.3031	87.7314	99.8804	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

101.1704	88.4687	92.5469	79.1705	74.9945	65.7857	64.1503	68.0419	70.1760	80.3031	87.7314	99.8804	(64)

Total per year (kWh/year) = Sum(64)m = 972.4197 (64)
12Total per year (kWh/year) 972 (64)
Electric shower(s)

57.8551	51.5494	56.2900	53.7168	54.7248	52.2022	53.9422	54.7248	53.7168	56.2900	55.2315	57.8551	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 658.0987 (64a)
Heat gains from water heating, kWh/month

39.7564	35.0045	37.2092	33.2218	32.4298	29.4970	29.5231	30.6917	30.9732	34.1483	35.7407	39.4339	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

169.4681	187.6254	169.4681	175.1171	169.4681	175.1171	169.4681	169.4681	175.1171	169.4681	175.1171	169.4681	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

285.5253	288.4881	281.0218	265.1269	245.0625	226.2048	213.6066	210.6438	218.1101	234.0050	254.0694	272.9272	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	(71)

Water heating gains (Table 5)

53.4360	52.0901	50.0124	46.1414	43.5885	40.9680	39.6816	41.2523	43.0183	45.8982	49.6399	53.0025	(72)

Total internal gains

574.3930	594.1672	566.4659	552.3490	524.0827	508.2534	488.7199	487.3277	502.2091	515.3349	544.7899	561.3614	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	2.3600	10.6334	0.6300	0.7000	0.7700	7.6693	(74)
East	5.8000	19.6403	0.6300	0.7000	0.7700	34.8135	(76)
West	2.8100	19.6403	0.6300	0.7000	0.7700	16.8665	(80)

Solar gains	59.3493	115.7534	191.3972	282.8227	351.4725	362.3194	343.8806	291.8544	223.5812	137.4067	73.8999	48.8926	(83)
Total gains	633.7423	709.9206	757.8631	835.1717	875.5552	870.5728	832.6005	779.1821	725.7902	652.7415	618.6899	610.2540	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	19.4742	19.5249	19.5748	19.8129	19.8581	20.0712	20.0712	20.1111	19.9885	19.8581	19.7669	19.6724	
alpha	2.2983	2.3017	2.3050	2.3209	2.3239	2.3381	2.3381	2.3407	2.3326	2.3239	2.3178	2.3115	
util living area	0.9577	0.9436	0.9227	0.8742	0.7973	0.6747	0.5517	0.5929	0.7629	0.8925	0.9423	0.9611	(86)
MIT	17.8024	18.0974	18.5885	19.3160	19.9911	20.5411	20.7990	20.7544	20.3347	19.4651	18.5350	17.7644	(87)
Th 2	20.0134	20.0157	20.0180	20.0286	20.0306	20.0399	20.0399	20.0416	20.0363	20.0306	20.0266	20.0224	(88)
util rest of house	0.9525	0.9365	0.9124	0.8560	0.7643	0.6148	0.4609	0.5052	0.7133	0.8734	0.9339	0.9562	(89)
MIT 2	17.0709	17.3638	17.8505	18.5689	19.2170	19.7240	19.9337	19.9049	19.5491	18.7246	17.8072	17.0388	(90)
Living area fraction									fLA = Living area / (4) =			0.2917	(91)
MIT	17.2843	17.5778	18.0658	18.7869	19.4428	19.9624	20.1861	20.1527	19.7783	18.9407	18.0195	17.2505	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.2843	17.5778	18.0658	18.7869	19.4428	19.9624	20.1861	20.1527	19.7783	18.9407	18.0195	17.2505	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9320	0.9128	0.8855	0.8272	0.7409	0.6094	0.4759	0.5164	0.6979	0.8460	0.9103	0.9368	(94)
Useful gains	590.6264	647.9843	671.1083	690.8585	648.6981	530.5565	396.2438	402.3428	506.4945	552.1903	563.1726	571.7054	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1693.3758	1649.1195	1500.6310	1267.3764	990.2810	678.5495	453.7829	473.9206	721.4976	1066.7414	1403.0124	1684.8639	(97)
Space heating kWh	820.4456	672.7629	617.1649	415.0929	254.1377	0.0000	0.0000	0.0000	0.0000	382.8260	604.6846	828.1899	(98a)

Space heating requirement - total per year (kWh/year) 4595.3045
Solar heating kWh

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)

Solar heating contribution - total per year (kWh/year) 0.0000
Space heating kWh

820.4456	672.7629	617.1649	415.0929	254.1377	0.0000	0.0000	0.0000	0.0000	382.8260	604.6846	828.1899	(98c)

Space heating requirement after solar contribution - total per year (kWh/year) 4595.3045
Space heating per m2 (98c) / (4) = 38.2178 (99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	1189.4625	936.3854	959.7822	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.6103	0.6820	0.6483	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	725.9270	638.5729	622.2328	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	929.2394	888.7922	829.9348	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	146.3850	186.1631	154.5303	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	36.5962	46.5408	38.6326	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												121.7696	(107)
Energy for space heating												38.2178	(99)
Energy for space cooling												1.0127	(108)
Total												39.2305	(109)
Fabric Energy Efficiency (TFEE)												39.2	(109)

Full SAP Calculation Printout

Property Reference	78449-05	**Issued on Date**	03/10/2025
Assessment Reference	001	**Prop Type Ref**	End
Property	846 Rochdale Road, MANCHESTER, M9 8FA		

SAP Rating	84 B	**DER**	3.36	**TER**	10.91
Environmental	97 A	**% DER < TER**			69.20
CO_2 Emissions (t/year)	0.39	**DFEE**	34.01	**TFEE**	39.23
Compliance Check	See BREL	**% DFEE < TFEE**			13.31
% DPER < TPER	37.92	**DPER**	35.54	**TPER**	57.25

Assessor Details	Mr. Daniel Goddard	**Assessor ID**	CP52-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.0600 (1b)	x	2.4800 (2b)	=	116.7088	(1b) - (3b)
First floor	49.7800 (1c)	x	2.7800 (2c)	=	138.3884	(1c) - (3c)
Second floor	23.4000 (1d)	x	2.7700 (2d)	=	64.8180	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	120.2400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	319.9152	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.2500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2125	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2709	0.2656	0.2603	0.2338	0.2284	0.2019	0.2019	0.1966	0.2125	0.2284	0.2391	0.2497	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	80.1000 (23c)

Effective ac	0.3704	0.3651	0.3598	0.3332	0.3279	0.3014	0.3014	0.2961	0.3120	0.3279	0.3386	0.3492	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door			4.1400	1.0000	4.1400			(26)
Window			10.9700	0.7752	8.5039			(27)
GF			47.0600	0.0900	4.2354	75.0000	3529.5000	(28a)
Exposed Floor			2.7200	0.1400	0.3808	20.0000	54.4000	(28b)
Main	136.0800	15.1100	120.9700	0.1300	15.7261	9.0000	1088.7300	(29a)
Dwarf Wall (PIRx0.72)	16.7700		16.7700	0.0900	1.5093	9.0000	150.9300	(29a)
PIJ	15.5100		15.5100	0.1300	2.0163	9.0000	139.5900	(30)
PIR	12.2300		12.2300	0.1300	1.5899	9.0000	110.0700	(30)
Residual Ceiling	26.3800		26.3800	0.0900	2.3742	9.0000	237.4200	(30)
Total net area of external elements Aum(A, m2)			256.7500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		40.4759			(33)
Main dwelling								
Party Wall 1			40.6300	0.0000	0.0000	20.0000	812.6000	(32)

Timber	124.1700		9.0000	1117.5300 (32c)
FF	47.0600		18.0000	847.0800 (32d)
SF	23.4000		18.0000	421.2000 (32d)
GF	47.0600		9.0000	423.5400 (32e)
FF	23.4000		9.0000	210.6000 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 9143.1900 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 76.0412 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	10.6900	0.1150	1.2293
E3 Sill	10.6900	0.0170	0.1817
E4 Jamb	35.4000	0.0940	3.3276
E5 Ground floor (normal)	22.8600	0.0670	1.5316
E11 Eaves (insulation at rafter level)	18.1000	0.0250	0.4525
E16 Corner (normal)	29.0400	0.0680	1.9747
E12 Gable (insulation at ceiling level)	5.6600	0.0770	0.4358
E6 Intermediate floor within a dwelling	39.5500	0.0320	1.2656
E17 Corner (inverted - internal area greater than external area)	2.4800	-0.0290	-0.0719
P1 Party wall - Ground floor	6.2400	0.3200	1.9968
E20 Exposed floor (normal)	3.3800	0.0790	0.2670
E21 Exposed floor (inverted)	3.3800	0.0630	0.2129
E13 Gable (insulation at rafter level)	8.2800	0.0740	0.6127
E18 Party wall between dwellings	5.5600	0.0920	0.5115
R6 Flat ceiling	18.1000	-0.0430	-0.7783
E25 Staggered party wall between dwellings	4.9600	0.0560	0.2778

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 13.4275 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 53.9034 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	39.1078	38.5470	37.9861	35.1819	34.6210	31.8168	31.8168	31.2559	32.9385	34.6210	35.7427	36.8644	(38)
Heat transfer coeff	93.0112	92.4503	91.8895	89.0852	88.5244	85.7201	85.7201	85.1593	86.8418	88.5244	89.6461	90.7678	(39)

Average = Sum(39)m / 12 = 88.9450

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7735	0.7689	0.7642	0.7409	0.7362	0.7129	0.7129	0.7082	0.7222	0.7362	0.7456	0.7549	(40)
HLP (average)												0.7397	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.8642 (42)
Hot water usage for mixer showers

72.2437	71.1580	69.5759	66.5490	64.3151	61.8240	60.4080	61.9781	63.6992	66.3739	69.4659	71.9669	(42a)

Hot water usage for baths

31.1904	30.7271	30.0748	28.8721	27.9715	26.9729	26.4334	27.0812	27.7865	28.8550	30.0826	31.0849	(42b)

Hot water usage for other uses

43.9627	42.3640	40.7654	39.1667	37.5681	35.9694	35.9694	37.5681	39.1667	40.7654	42.3640	43.9627	(42c)

Average daily hot water use (litres/day) 135.4907 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	147.3967	144.2491	140.4161	134.5878	129.8547	124.7663	122.8109	126.6274	130.6524	135.9943	141.9125	147.0144	(44)
Energy conte	233.4403	205.4088	215.8143	184.2439	174.8094	153.4147	148.5292	156.7911	161.1075	184.5430	202.1803	230.1891	(45)
Energy content (annual)										Total = Sum(45)m =		2250.4717	
Distribution loss (46)m = 0.15 x (45)m	35.0160	30.8113	32.3722	27.6366	26.2214	23.0122	22.2794	23.5187	24.1661	27.6815	30.3271	34.5284	(46)
Water storage loss:													
Store volume												210.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5800	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8532	(55)
Total storage loss	26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(56)
If cylinder contains dedicated solar storage	26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	283.1519	250.3096	265.5259	232.3519	224.5210	201.5227	198.2408	206.5027	209.2155	234.2546	250.2883	279.9007	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	283.1519	250.3096	265.5259	232.3519	224.5210	201.5227	198.2408	206.5027	209.2155	234.2546	250.2883	279.9007	(64)
										Total per year (kWh/year) = Sum(64)m =		2835.7857	(64)
12Total per year (kWh/year)												2836	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	117.3882	104.2191	111.5276	99.7475	97.8934	89.4968	89.1552	91.9023	92.0546	101.1298	105.7114	116.3071	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	173.9086	192.5416	173.9086	179.7055	173.9086	179.7055	173.9086	173.9086	179.7055	173.9086	179.7055	173.9086	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	285.5253	288.4881	281.0218	265.1269	245.0625	226.2048	213.6066	210.6438	218.1101	234.0050	254.0694	272.9272	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	(71)
Water heating gains (Table 5)	157.7798	155.0879	149.9026	138.5382	131.5771	124.3011	119.8323	123.5246	127.8537	135.9272	146.8213	156.3268	(72)
Total internal gains	683.1772	702.0812	670.7966	649.3342	616.5118	596.1749	573.3110	574.0405	591.6328	609.8043	646.5598	669.1261	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	2.3600	10.6334	0.3000	0.0000	0.7700	5.7969	(74)
East	5.8000	19.6403	0.3000	0.0000	0.7700	26.3140	(76)
West	2.8100	19.6403	0.3000	0.0000	0.7700	12.7487	(80)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	44.8596	87.4931	144.6691	213.7738	265.6632	273.8620	259.9249	220.6005	168.9956	103.8599	55.8578	36.9559	(83)
Total gains	728.0368	789.5744	815.4657	863.1080	882.1750	870.0369	833.2359	794.6410	760.6284	713.6642	702.4177	706.0819	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	27.3061	27.4718	27.6395	28.5095	28.6901	29.6287	29.6287	29.8238	29.2460	28.6901	28.3311	27.9810	
alpha	2.8204	2.8315	2.8426	2.9006	2.9127	2.9752	2.9752	2.9883	2.9497	2.9127	2.8887	2.8654	
util living area	0.9336	0.9145	0.8867	0.8196	0.7182	0.5602	0.4282	0.4609	0.6522	0.8303	0.9067	0.9377	(86)
Living	18.9578	19.2043	19.5692	20.1200	20.5484	20.8527	20.9509	20.9384	20.7529	20.2190	19.5564	18.9648	
Non living	18.3802	18.6250	18.9859	19.5334	19.9390	20.2247	20.3014	20.2970	20.1367	19.6374	18.9885	18.3985	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	19.9553	19.2043	19.5692	20.1200	20.5484	20.8527	20.9509	20.9384	20.7529	20.2190	19.5564	19.2495	(87)
Th 2	20.2763	20.2804	20.2845	20.3048	20.3089	20.3294	20.3294	20.3336	20.3212	20.3089	20.3008	20.2926	(88)
util rest of house	0.9270	0.9061	0.8751	0.8008	0.6877	0.5145	0.3697	0.4025	0.6091	0.8090	0.8963	0.9315	(89)
MIT 2	19.3063	18.6250	18.9859	19.5334	19.9390	20.2247	20.3014	20.2970	20.1367	19.6374	18.9885	18.6635	(90)
Living area fraction									fLA = Living area / (4) =			0.2917	(91)
MIT	19.4957	18.7940	19.1560	19.7046	20.1168	20.4079	20.4909	20.4841	20.3165	19.8071	19.1542	18.8344	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4957	18.7940	19.1560	19.7046	20.1168	20.4079	20.4909	20.4841	20.3165	19.8071	19.1542	18.8344	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9189	0.8850	0.8537	0.7827	0.6786	0.5200	0.3841	0.4160	0.6087	0.7916	0.8759	0.9161	(94)
Useful gains	669.0002	698.8081	696.1251	675.5183	598.6846	452.4620	320.0504	330.6073	463.0195	564.9185	615.2614	646.8454	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1413.3668	1284.5031	1162.9577	962.5259	745.0931	497.8563	333.5266	347.8027	539.8497	815.0512	1080.6086	1328.3361	(97)
Space heating kWh	553.8087	393.5870	347.3234	206.6455	108.9279	0.0000	0.0000	0.0000	0.0000	186.0987	335.0500	507.0290	(98a)
Space heating requirement - total per year (kWh/year)												2638.4703	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	553.8087	393.5870	347.3234	206.6455	108.9279	0.0000	0.0000	0.0000	0.0000	186.0987	335.0500	507.0290	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2638.4703	
Space heating per m2											(98c) / (4) =	21.9434	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Efficiency of main space heating system 1 (in %)	281.3941 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	553.8087	393.5870	347.3234	206.6455	108.9279	0.0000	0.0000	0.0000	0.0000	186.0987	335.0500	507.0290	(98)
Space heating efficiency (main heating system 1)	281.3941	281.3941	281.3941	281.3941	281.3941	0.0000	0.0000	0.0000	0.0000	281.3941	281.3941	281.3941	(210)
Space heating fuel (main heating system)	196.8089	139.8704	123.4295	73.4363	38.7101	0.0000	0.0000	0.0000	0.0000	66.1346	119.0679	180.1847	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	283.1519	250.3096	265.5259	232.3519	224.5210	201.5227	198.2408	206.5027	209.2155	234.2546	250.2883	279.9007	(64)
Efficiency of water heater												279.7109	(216)
(217)m	279.7109	279.7109	279.7109	279.7109	279.7109	279.7109	279.7109	279.7109	279.7109	279.7109	279.7109	279.7109	(217)
Fuel for water heating, kWh/month	101.2302	89.4887	94.9287	83.0686	80.2689	72.0468	70.8734	73.8272	74.7970	83.7488	89.4811	100.0678	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	45.0156	40.6593	45.0156	43.5635	45.0156	43.5635	45.0156	45.0156	43.5635	45.0156	43.5635	45.0156	(231)
Lighting	36.6415	29.3952	26.4671	19.3909	14.9781	12.2373	13.6635	17.7604	23.0690	30.2678	34.1874	37.6599	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	937.6424	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	279.7109	
Water heating fuel used	1013.8274	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.3580)		
mechanical ventilation fans (SFP = 1.3580)	530.0227	(230a)
Total electricity for the above, kWh/year	530.0227	(231)
Electricity for lighting (calculated in Appendix L)	295.7182	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2777.2107	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	937.6424	0.1550	145.2986	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1013.8274	0.1410	142.9361	(264)
Space and water heating			288.2347	(265)
Pumps, fans and electric keep-hot	530.0227	0.1387	73.5207	(267)
Energy for lighting	295.7182	0.1443	42.6813	(268)
Total CO2, kg/year			404.4367	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.3600	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	937.6424	1.5737	1475.5489	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1013.8274	1.5213	1542.3577	(278)
Space and water heating			3017.9066	(279)
Pumps, fans and electric keep-hot	530.0227	1.5128	801.8183	(281)
Energy for lighting	295.7182	1.5338	453.5824	(282)
Total Primary energy kWh/year			4273.3074	(286)
Dwelling Primary energy Rate (DPER)			35.5400	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.0600 (1b)	x	2.4800 (2b)	=	116.7088	(1b) - (3b)
First floor	49.7800 (1c)	x	2.7800 (2c)	=	138.3884	(1c) - (3c)
Second floor	23.4000 (1d)	x	2.7700 (2d)	=	64.8180	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	120.2400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	319.9152	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	4 * 10 =	40.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1250	(8)
Pressure test		Yes	

Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.3750	(18)
Number of sides sheltered	2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3188	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4064	0.3985	0.3905	0.3507	0.3427	0.3028	0.3028	0.2949	0.3188	0.3427	0.3586	0.3746	(22b)
Effective ac	0.5826	0.5794	0.5762	0.5615	0.5587	0.5459	0.5459	0.5435	0.5508	0.5587	0.5643	0.5701	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			4.1400	1.0000	4.1400			(26)
TER Opening Type			10.9700	1.1450	12.5611			(27)
GF			47.0600	0.1300	6.1178			(28a)
Exposed Floor			2.7200	0.1300	0.3536			(28b)
Main	136.0800	15.1100	120.9700	0.1800	21.7746			(29a)
Dwarf Wall (PIRx0.72)	16.7700		16.7700	0.1800	3.0186			(29a)
PIJ	15.5100		15.5100	0.1100	1.7061			(30)
PIR	12.2300		12.2300	0.1100	1.3453			(30)
Residual Ceiling	26.3800		26.3800	0.1100	2.9018			(30)
Total net area of external elements Aum(A, m2)			256.7500					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	53.9189			(33)
Main dwelling								
Party Wall 1			40.6300	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	76.0412	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	10.6900	0.0500	0.5345
E3 Sill	10.6900	0.0500	0.5345
E4 Jamb	35.4000	0.0500	1.7700
E5 Ground floor (normal)	22.8600	0.1600	3.6576
E11 Eaves (insulation at rafter level)	18.1000	0.0400	0.7240
E16 Corner (normal)	29.0400	0.0900	2.6136
E12 Gable (insulation at ceiling level)	5.6600	0.0600	0.3396
E6 Intermediate floor within a dwelling	39.5500	0.0000	0.0000
E17 Corner (inverted - internal area greater than external area)	2.4800	-0.0900	-0.2232
P1 Party wall - Ground floor	6.2400	0.0800	0.4992
E20 Exposed floor (normal)	3.3800	0.3200	1.0816
E21 Exposed floor (inverted)	3.3800	0.3200	1.0816
E13 Gable (insulation at rafter level)	8.2800	0.0800	0.6624
E18 Party wall between dwellings	5.5600	0.0600	0.3336
R6 Flat ceiling	18.1000	0.0600	1.0860
E25 Staggered party wall between dwellings	4.9600	0.0600	0.2976

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	14.9926	(36)
Point Thermal bridges	(36a) = 0.0000	
Total fabric heat loss	(33) + (36) + (36a) = 68.9115	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	61.5060	61.1674	60.8355	59.2766	58.9849	57.6271	57.6271	57.3757	58.1501	58.9849	59.5749	60.1918	(38)
Heat transfer coeff	130.4175	130.0789	129.7470	128.1880	127.8964	126.5386	126.5386	126.2871	127.0616	127.8964	128.4864	129.1033	(39)
Average = Sum(39)m / 12 =												128.1866	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0846	1.0818	1.0791	1.0661	1.0637	1.0524	1.0524	1.0503	1.0567	1.0637	1.0686	1.0737	(40)
HLP (average)												1.0661	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.8642	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
72.2437	71.1580	69.5759	66.5490	64.3151	61.8240	60.4080	61.9781	63.6992	66.3739	69.4659	71.9669	(42a)

Hot water usage for baths

31.1904	30.7271	30.0748	28.8721	27.9715	26.9729	26.4334	27.0812	27.7865	28.8550	30.0826	31.0849	(42b)

Hot water usage for other uses

43.9627	42.3640	40.7654	39.1667	37.5681	35.9694	35.9694	37.5681	39.1667	40.7654	42.3640	43.9627	(42c)

Average daily hot water use (litres/day)	135.4907	(43)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use												
147.3967	144.2491	140.4161	134.5878	129.8547	124.7663	122.8109	126.6274	130.6524	135.9943	141.9125	147.0144	(44)
Energy conte 233.4403	205.4088	215.8143	184.2439	174.8094	153.4147	148.5292	156.7911	161.1075	184.5430	202.1803	230.1891	(45)
Energy content (annual)										Total = Sum(45)m =		2250.4717	
Distribution loss (46)m = 0.15 x (45)m													
35.0160	30.8113	32.3722	27.6366	26.2214	23.0122	22.2794	23.5187	24.1661	27.6815	30.3271	34.5284	(46)

Water storage loss:		
Store volume	210.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):	1.7016	(48)
Temperature factor from Table 2b	0.5400	(49)
Enter (49) or (54) in (55)	0.9188	(55)

Total storage loss

28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842	(56)

If cylinder contains dedicated solar storage

28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

285.1869	252.1477	267.5609	234.3213	226.5560	203.4920	200.2757	208.5377	211.1848	236.2896	252.2577	281.9357	(62)
WWHRS -33.0268	-29.2092	-30.5861	-25.3265	-23.6034	-20.1976	-18.9320	-20.1323	-20.8972	-24.6355	-27.9091	-32.4152	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

	252.1601	222.9385	236.9748	208.9947	202.9525	183.2944	181.3437	188.4054	190.2876	211.6541	224.3486	249.5205 (64)
										Total per year (kWh/year) = Sum(64)m =		2552.8750 (64)
12Total per year (kWh/year)												2553 (64)

Electric shower(s)

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000 (64a)

Heat gains from water heating, kWh/month

	119.0162	105.6895	113.1555	101.3230	99.5214	91.0723	90.7832	93.5303	93.6301	102.7578	107.2868	117.9351 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	169.4681	187.6254	169.4681	175.1171	169.4681	175.1171	169.4681	169.4681	175.1171	169.4681	175.1171	169.4681	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	285.5253	288.4881	281.0218	265.1269	245.0625	226.2048	213.6066	210.6438	218.1101	234.0050	254.0694	272.9272	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	(71)

Water heating gains (Table 5)

	159.9680	157.2761	152.0908	140.7264	133.7653	126.4893	122.0205	125.7128	130.0418	138.1154	149.0095	158.5150	(72)

Total internal gains

	683.9250	702.3532	671.5443	649.9339	617.2595	593.7747	571.0588	571.7883	589.2325	610.5520	647.1595	669.8738	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	2.3600	10.6334	0.6300	0.7000	0.7700	7.6693	(74)
East	5.8000	19.6403	0.6300	0.7000	0.7700	34.8135	(76)
West	2.8100	19.6403	0.6300	0.7000	0.7700	16.8665	(80)

Solar gains	59.3493	115.7534	191.3972	282.8227	351.4725	362.3194	343.8806	291.8544	223.5812	137.4067	73.8999	48.8926	(83)
Total gains	743.2742	818.1066	862.9415	932.7567	968.7320	956.0940	914.9394	863.6427	812.8137	747.9587	721.0595	718.7664	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	19.4742	19.5249	19.5748	19.8129	19.8581	20.0712	20.0712	20.1111	19.9885	19.8581	19.7669	19.6724	
alpha	2.2983	2.3017	2.3050	2.3209	2.3239	2.3381	2.3381	2.3407	2.3326	2.3239	2.3178	2.3115	
util living area													
	0.9427	0.9267	0.9028	0.8498	0.7671	0.6405	0.5164	0.5541	0.7259	0.8653	0.9234	0.9466	(86)
MIT	17.9931	18.2772	18.7513	19.4443	20.0836	20.5925	20.8261	20.7886	20.4097	19.5977	18.7047	17.9563	(87)
Th 2	20.0134	20.0157	20.0180	20.0286	20.0306	20.0399	20.0399	20.0416	20.0363	20.0306	20.0266	20.0224	(88)
util rest of house													
	0.9358	0.9179	0.8904	0.8292	0.7317	0.5796	0.4278	0.4677	0.6734	0.8427	0.9127	0.9402	(89)
MIT 2	16.4781	16.8381	17.4382	18.3096	19.0909	19.6845	19.9238	19.8932	19.4895	18.5135	17.3900	16.4360	(90)
Living area fraction									fLA = Living area / (4) =			0.2917	(91)
MIT	16.9201	17.2580	17.8213	18.6407	19.3805	19.9494	20.1871	20.1545	19.7579	18.8298	17.7736	16.8796	(92)
Temperature adjustment												0.0000	
adjusted MIT	16.9201	17.2580	17.8213	18.6407	19.3805	19.9494	20.1871	20.1545	19.7579	18.8298	17.7736	16.8796	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9049	0.8838	0.8537	0.7928	0.7040	0.5732	0.4424	0.4787	0.6559	0.8073	0.8788	0.9104	(94)
Useful gains	672.5564	723.0074	736.7218	739.4614	681.9830	548.0586	404.7522	413.4073	533.1442	603.7944	633.6402	654.4001	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1645.8803	1607.5120	1468.9036	1248.6379	982.3070	676.9086	453.9013	474.1390	718.9052	1052.5640	1371.4077	1636.9720	(97)
Space heating kWh													
	724.1530	594.3871	544.7432	366.6071	223.4411	0.0000	0.0000	0.0000	0.0000	333.8846	531.1926	731.0335	(98a)
Space heating requirement - total per year (kWh/year)												4049.4422	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	724.1530	594.3871	544.7432	366.6071	223.4411	0.0000	0.0000	0.0000	0.0000	333.8846	531.1926	731.0335	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4049.4422	
Space heating per m2											(98c) / (4) =	33.6780	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	724.1530	594.3871	544.7432	366.6071	223.4411	0.0000	0.0000	0.0000	0.0000	333.8846	531.1926	731.0335	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)

Space heating fuel (main heating system)

	784.5644	643.9731	590.1877	397.1908	242.0813	0.0000	0.0000	0.0000	0.0000	361.7384	575.5066	792.0190 (211)

Space heating efficiency (main heating system 2)

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)

Space heating fuel (main heating system 2)

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)

Space heating fuel (secondary)

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)

Water heating

Water heating requirement

	252.1601	222.9385	236.9748	208.9947	202.9525	183.2944	181.3437	188.4054	190.2876	211.6541	224.3486	249.5205 (64)

Efficiency of water heater

												79.8000 (216)
(217)m	86.2866	86.1498	85.8643	85.3067	84.2760	79.8000	79.8000	79.8000	79.8000	85.0773	85.9225	86.3226 (217)

Fuel for water heating, kWh/month

	292.2357	258.7802	275.9874	244.9922	240.8190	229.6923	227.2477	236.0970	238.4556	248.7785	261.1057	289.0559 (219)

Space cooling fuel requirement

(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	35.2121	28.2485	25.4346	18.6345	14.3938	11.7599	13.1305	17.0676	22.1691	29.0870	32.8537	36.1908 (232)

Electricity generated by PVs (Appendix M) (negative quantity)

(233a)m	-44.8072	-63.5497	-91.8382	-103.7677	-112.2423	-104.8160	-103.4928	-97.5518	-87.0985	-72.9046	-49.3875	-38.6916 (233a)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)

Electricity generated by PVs (Appendix M) (negative quantity)

(233b)m	-24.0979	-50.8552	-101.4085	-152.8048	-202.5583	-203.7721	-201.4037	-170.3034	-124.5108	-72.9191	-32.2313	-19.0454 (233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year

Space heating fuel - main system 1	4387.2614 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	79.8000
Water heating fuel used	3043.2471 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
Total electricity for the above, kWh/year	86.0000 (231)
Electricity for lighting (calculated in Appendix L)	284.1821 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-2326.0585 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	5474.6321 (238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	4387.2614	0.2100	921.3249	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3043.2471	0.2100	639.0819	(264)
Space and water heating			1560.4068	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	284.1821	0.1443	41.0163	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-970.1480	0.1345	-130.4743	
PV Unit electricity exported	-1355.9105	0.1258	-170.5666	
Total			-301.0408	(269)
Total CO2, kg/year			1312.3115	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.9100	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	4387.2614	1.1300	4957.6053	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3043.2471	1.1300	3438.8693	(278)
Space and water heating			8396.4746	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	284.1821	1.5338	435.8880	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-970.1480	1.4970	-1452.3538	
PV Unit electricity exported	-1355.9105	0.4617	-626.0894	
Total			-2078.4431	(283)
Total Primary energy kWh/year			6884.0203	(286)
Target Primary Energy Rate (TPER)			57.2500	(287)

Full SAP Calculation Printout

Property Reference	78449-05	**Issued on Date**	03/10/2025
Assessment Reference	001	**Prop Type Ref**	End
Property	846 Rochdale Road, MANCHESTER, M9 8FA		

SAP Rating	84 B	**DER**	3.36	**TER**	10.91
Environmental	97 A	**% DER < TER**			69.20
CO_2 Emissions (t/year)	0.39	**DFEE**	34.01	**TFEE**	39.23
Compliance Check	See BREL	**% DFEE < TFEE**			13.31
% DPER < TPER	37.92	**DPER**	35.54	**TPER**	57.25

Assessor Details	Mr. Daniel Goddard	**Assessor ID**	CP52-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.0600 (1b)	x	2.4800 (2b)	=	116.7088	(1b) - (3b)
First floor	49.7800 (1c)	x	2.7800 (2c)	=	138.3884	(1c) - (3c)
Second floor	23.4000 (1d)	x	2.7700 (2d)	=	64.8180	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	120.2400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	319.9152	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.2500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2125	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2709	0.2656	0.2603	0.2338	0.2284	0.2019	0.2019	0.1966	0.2125	0.2284	0.2391	0.2497	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	80.1000 (23c)

Effective ac	0.3704	0.3651	0.3598	0.3332	0.3279	0.3014	0.3014	0.2961	0.3120	0.3279	0.3386	0.3492	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door			4.1400	1.0000	4.1400			(26)
Window			10.9700	0.7752	8.5039			(27)
GF			47.0600	0.0900	4.2354	75.0000	3529.5000	(28a)
Exposed Floor			2.7200	0.1400	0.3808	20.0000	54.4000	(28b)
Main	136.0800	15.1100	120.9700	0.1300	15.7261	9.0000	1088.7300	(29a)
Dwarf Wall (PIRx0.72)	16.7700		16.7700	0.0900	1.5093	9.0000	150.9300	(29a)
PIJ	15.5100		15.5100	0.1300	2.0163	9.0000	139.5900	(30)
PIR	12.2300		12.2300	0.1300	1.5899	9.0000	110.0700	(30)
Residual Ceiling	26.3800		26.3800	0.0900	2.3742	9.0000	237.4200	(30)
Total net area of external elements Aum(A, m2)			256.7500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		40.4759			(33)
Main dwelling								
Party Wall 1			40.6300	0.0000	0.0000	20.0000	812.6000	(32)

Timber	124.1700		9.0000	1117.5300 (32c)
FF	47.0600		18.0000	847.0800 (32d)
SF	23.4000		18.0000	421.2000 (32d)
GF	47.0600		9.0000	423.5400 (32e)
FF	23.4000		9.0000	210.6000 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 9143.1900 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 76.0412 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	10.6900	0.1150	1.2293
E3 Sill	10.6900	0.0170	0.1817
E4 Jamb	35.4000	0.0940	3.3276
E5 Ground floor (normal)	22.8600	0.0670	1.5316
E11 Eaves (insulation at rafter level)	18.1000	0.0250	0.4525
E16 Corner (normal)	29.0400	0.0680	1.9747
E12 Gable (insulation at ceiling level)	5.6600	0.0770	0.4358
E6 Intermediate floor within a dwelling	39.5500	0.0320	1.2656
E17 Corner (inverted - internal area greater than external area)	2.4800	-0.0290	-0.0719
P1 Party wall - Ground floor	6.2400	0.3200	1.9968
E20 Exposed floor (normal)	3.3800	0.0790	0.2670
E21 Exposed floor (inverted)	3.3800	0.0630	0.2129
E13 Gable (insulation at rafter level)	8.2800	0.0740	0.6127
E18 Party wall between dwellings	5.5600	0.0920	0.5115
R6 Flat ceiling	18.1000	-0.0430	-0.7783
E25 Staggered party wall between dwellings	4.9600	0.0560	0.2778

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 13.4275 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 53.9034 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	39.1078	38.5470	37.9861	35.1819	34.6210	31.8168	31.8168	31.2559	32.9385	34.6210	35.7427	36.8644	(38)
Heat transfer coeff	93.0112	92.4503	91.8895	89.0852	88.5244	85.7201	85.7201	85.1593	86.8418	88.5244	89.6461	90.7678	(39)

Average = Sum(39)m / 12 = 88.9450

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7735	0.7689	0.7642	0.7409	0.7362	0.7129	0.7129	0.7082	0.7222	0.7362	0.7456	0.7549	(40)
HLP (average)												0.7397	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.8642 (42)
Hot water usage for mixer showers

72.2437	71.1580	69.5759	66.5490	64.3151	61.8240	60.4080	61.9781	63.6992	66.3739	69.4659	71.9669	(42a)

Hot water usage for baths

31.1904	30.7271	30.0748	28.8721	27.9715	26.9729	26.4334	27.0812	27.7865	28.8550	30.0826	31.0849	(42b)

Hot water usage for other uses

43.9627	42.3640	40.7654	39.1667	37.5681	35.9694	35.9694	37.5681	39.1667	40.7654	42.3640	43.9627	(42c)

Average daily hot water use (litres/day) 135.4907 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	147.3967	144.2491	140.4161	134.5878	129.8547	124.7663	122.8109	126.6274	130.6524	135.9943	141.9125	147.0144	(44)
Energy conte	233.4403	205.4088	215.8143	184.2439	174.8094	153.4147	148.5292	156.7911	161.1075	184.5430	202.1803	230.1891	(45)
Energy content (annual)										Total = Sum(45)m =		2250.4717	
Distribution loss (46)m = 0.15 x (45)m	35.0160	30.8113	32.3722	27.6366	26.2214	23.0122	22.2794	23.5187	24.1661	27.6815	30.3271	34.5284	(46)
Water storage loss:													
Store volume												210.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5800	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8532	(55)
Total storage loss	26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(56)
If cylinder contains dedicated solar storage	26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	283.1519	250.3096	265.5259	232.3519	224.5210	201.5227	198.2408	206.5027	209.2155	234.2546	250.2883	279.9007	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	283.1519	250.3096	265.5259	232.3519	224.5210	201.5227	198.2408	206.5027	209.2155	234.2546	250.2883	279.9007	(64)
										Total per year (kWh/year) = Sum(64)m =		2835.7857	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	117.3882	104.2191	111.5276	99.7475	97.8934	89.4968	89.1552	91.9023	92.0546	101.1298	105.7114	116.3071	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	41.8620	37.1814	30.2380	22.8921	17.1121	14.4468	15.6102	20.2908	27.2342	34.5801	40.3601	43.0254	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	426.1571	430.5793	419.4356	395.7119	365.7649	337.6190	318.8159	314.3937	325.5374	349.2611	379.2081	407.3540	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	(71)
Water heating gains (Table 5)	157.7798	155.0879	149.9026	138.5382	131.5771	124.3011	119.8323	123.5246	127.8537	135.9272	146.8213	156.3268	(72)
Total internal gains	738.1333	735.1831	711.9106	669.4765	626.7886	588.7013	566.5928	570.5435	592.9597	632.1028	678.7239	719.0406	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	2.3600	10.6334	0.3000	0.0000	0.7700	5.7969	(74)
East	5.8000	19.6403	0.3000	0.0000	0.7700	26.3140	(76)
West	2.8100	19.6403	0.3000	0.0000	0.7700	12.7487	(80)

Solar gains	44.8596	87.4931	144.6691	213.7738	265.6632	273.8620	259.9249	220.6005	168.9956	103.8599	55.8578	36.9559	(83)
Total gains	782.9929	822.6762	856.5796	883.2503	892.4518	862.5633	826.5176	791.1440	761.9553	735.9628	734.5817	755.9965	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	27.3061	27.4718	27.6395	28.5095	28.6901	29.6287	29.6287	29.8238	29.2460	28.6901	28.3311	27.9810	
alpha	2.8204	2.8315	2.8426	2.9006	2.9127	2.9752	2.9752	2.9883	2.9497	2.9127	2.8887	2.8654	
util living area	0.9225	0.9069	0.8755	0.8124	0.7137	0.5638	0.4312	0.4626	0.6515	0.8209	0.8977	0.9277	(86)
Living	19.0573	19.2607	19.6322	20.1441	20.5564	20.8501	20.9500	20.9378	20.7536	20.2467	19.6100	19.0573	
Non living	18.4773	18.6796	19.0460	19.5557	19.9460	20.2228	20.3008	20.2966	20.1373	19.6628	19.0399	18.4889	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.0062	19.2607	19.6322	20.1441	20.5564	20.8501	20.9500	20.9378	20.7536	20.2467	19.6100	19.3290	(87)
Th 2	20.2763	20.2804	20.2845	20.3048	20.3089	20.3294	20.3294	20.3336	20.3212	20.3089	20.3008	20.2926	(88)
util rest of house	0.9150	0.8980	0.8631	0.7932	0.6831	0.5180	0.3724	0.4041	0.6083	0.7990	0.8866	0.9207	(89)
MIT 2	19.3560	18.6796	19.0460	19.5557	19.9460	20.2228	20.3008	20.2966	20.1373	19.6628	19.0399	18.7412	(90)
Living area fraction										fLA = Living area / (4) =		0.2917	(91)
MIT	19.5457	18.8492	19.2170	19.7274	20.1241	20.4058	20.4902	20.4837	20.3171	19.8332	19.2062	18.9127	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5457	18.8492	19.2170	19.7274	20.1241	20.4058	20.4902	20.4837	20.3171	19.8332	19.2062	18.9127	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9064	0.8766	0.8415	0.7754	0.6743	0.5234	0.3868	0.4176	0.6080	0.7821	0.8660	0.9044	(94)
Useful gains	709.7394	721.1179	720.8435	684.8747	601.7891	451.4949	319.7354	330.3950	463.3041	575.5686	636.1233	683.7377	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1418.0199	1289.6037	1168.5626	964.5596	745.7355	497.6735	333.4693	347.7640	539.9060	817.3618	1085.2741	1335.4403	(97)
Space heating kWh	526.9607	382.0225	333.1030	201.3731	107.0961	0.0000	0.0000	0.0000	0.0000	179.8941	323.3886	484.8667	(98a)
Space heating requirement - total per year (kWh/year)												2538.7048	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	526.9607	382.0225	333.1030	201.3731	107.0961	0.0000	0.0000	0.0000	0.0000	179.8941	323.3886	484.8667	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2538.7048	
Space heating per m2											(98c) / (4) =	21.1136	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	281.3941	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	526.9607	382.0225	333.1030	201.3731	107.0961	0.0000	0.0000	0.0000	0.0000	179.8941	323.3886	484.8667	(98)
Space heating efficiency (main heating system 1)	281.3941	281.3941	281.3941	281.3941	281.3941	0.0000	0.0000	0.0000	0.0000	281.3941	281.3941	281.3941	(210)
Space heating fuel (main heating system)	187.2679	135.7607	118.3760	71.5627	38.0591	0.0000	0.0000	0.0000	0.0000	63.9296	114.9237	172.3088	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	283.1519	250.3096	265.5259	232.3519	224.5210	201.5227	198.2408	206.5027	209.2155	234.2546	250.2883	279.9007	(64)
Efficiency of water heater												279.7109	(216)
(217)m	279.7109	279.7109	279.7109	279.7109	279.7109	279.7109	279.7109	279.7109	279.7109	279.7109	279.7109	279.7109	(217)
Fuel for water heating, kWh/month	101.2302	89.4887	94.9287	83.0686	80.2689	72.0468	70.8734	73.8272	74.7970	83.7488	89.4811	100.0678	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	45.0156	40.6593	45.0156	43.5635	45.0156	43.5635	45.0156	45.0156	43.5635	45.0156	43.5635	45.0156	(231)
Lighting	36.6415	29.3952	26.4671	19.3909	14.9781	12.2373	13.6635	17.7604	23.0690	30.2678	34.1874	37.6599	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													

(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	902.1884	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	279.7109	
Water heating fuel used	1013.8274	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.3580)		
mechanical ventilation fans (SFP = 1.3580)	530.0227	(230a)
Total electricity for the above, kWh/year	530.0227	(231)
Electricity for lighting (calculated in Appendix L)	295.7182	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2741.7567	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	902.1884	16.4900	148.7709	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1013.8274	16.4900	167.1801	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	530.0227	16.4900	87.4007	(249)
Energy for lighting	295.7182	16.4900	48.7639	(250)
Additional standing charges			0.0000	(251)
Total energy cost			452.1157	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.9850	(257)
SAP value		84.0331	
SAP rating (Section 12)		84	(258)
SAP band		B	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	902.1884	0.1549	139.7494	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1013.8274	0.1410	142.9361	(264)
Space and water heating			282.6855	(265)
Pumps, fans and electric keep-hot	530.0227	0.1387	73.5207	(267)
Energy for lighting	295.7182	0.1443	42.6813	(268)
Total CO2, kg/year			398.8875	(272)
CO2 emissions per m2			3.3200	(273)
EI value			96.7653	
EI rating			97	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)			Volume (m3)	
Main dwelling							
Ground floor	47.0600	(1b)	x 2.4800	(2b)	=	116.7088	(1b) - (3b)
First floor	49.7800	(1c)	x 2.7800	(2c)	=	138.3884	(1c) - (3c)
Second floor	23.4000	(1d)	x 2.7700	(2d)	=	64.8180	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	120.2400						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)		=	319.9152	(5)

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2. Ventilation rate

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m3 per hour

Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.2500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2125	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.6000	4.5000	4.5000	4.1000	4.2000	3.7000	3.5000	3.5000	3.7000	4.1000	4.1000	4.2000	(22)
Wind factor	1.1500	1.1250	1.1250	1.0250	1.0500	0.9250	0.8750	0.8750	0.9250	1.0250	1.0250	1.0500	(22a)
Adj infilt rate	0.2444	0.2391	0.2391	0.2178	0.2231	0.1966	0.1859	0.1859	0.1966	0.2178	0.2178	0.2231	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	80.1000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.3439	0.3386	0.3386	0.3173	0.3226	0.2961	0.2854	0.2854	0.2961	0.3173	0.3173	0.3226	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Door			4.1400	1.0000	4.1400			(26)
Window			10.9700	0.7752	8.5039			(27)
GF			47.0600	0.0900	4.2354	75.0000	3529.5000	(28a)
Exposed Floor			2.7200	0.1400	0.3808	20.0000	54.4000	(28b)
Main	136.0800	15.1100	120.9700	0.1300	15.7261	9.0000	1088.7300	(29a)
Dwarf Wall (PIRx0.72)	16.7700		16.7700	0.0900	1.5093	9.0000	150.9300	(29a)
PIJ	15.5100		15.5100	0.1300	2.0163	9.0000	139.5900	(30)
PIR	12.2300		12.2300	0.1300	1.5899	9.0000	110.0700	(30)
Residual Ceiling	26.3800		26.3800	0.0900	2.3742	9.0000	237.4200	(30)
Total net area of external elements Aum(A, m2)			256.7500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		40.4759			(33)
Main dwelling								
Party Wall 1			40.6300	0.0000	0.0000	20.0000	812.6000	(32)
Timber			124.1700			9.0000	1117.5300	(32c)
FF			47.0600			18.0000	847.0800	(32d)
SF			23.4000			18.0000	421.2000	(32d)
GF			47.0600			9.0000	423.5400	(32e)
FF			23.4000			9.0000	210.6000	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	9143.1900 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		76.0412 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	10.6900	0.1150	1.2293
E3 Sill	10.6900	0.0170	0.1817
E4 Jamb	35.4000	0.0940	3.3276
E5 Ground floor (normal)	22.8600	0.0670	1.5316
E11 Eaves (insulation at rafter level)	18.1000	0.0250	0.4525
E16 Corner (normal)	29.0400	0.0680	1.9747
E12 Gable (insulation at ceiling level)	5.6600	0.0770	0.4358
E6 Intermediate floor within a dwelling	39.5500	0.0320	1.2656
E17 Corner (inverted - internal area greater than external area)	2.4800	-0.0290	-0.0719
P1 Party wall - Ground floor	6.2400	0.3200	1.9968
E20 Exposed floor (normal)	3.3800	0.0790	0.2670
E21 Exposed floor (inverted)	3.3800	0.0630	0.2129
E13 Gable (insulation at rafter level)	8.2800	0.0740	0.6127
E18 Party wall between dwellings	5.5600	0.0920	0.5115
R6 Flat ceiling	18.1000	-0.0430	-0.7783
E25 Staggered party wall between dwellings	4.9600	0.0560	0.2778

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		13.4275 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	53.9034 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	36.3036	35.7427	35.7427	33.4993	34.0602	31.2559	30.1342	30.1342	31.2559	33.4993	33.4993	34.0602	(38)
Heat transfer coeff	90.2069	89.6461	89.6461	87.4027	87.9635	85.1593	84.0376	84.0376	85.1593	87.4027	87.4027	87.9635	(39)
Average = Sum(39)m / 12 =												87.1690	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7502	0.7456	0.7456	0.7269	0.7316	0.7082	0.6989	0.6989	0.7082	0.7269	0.7269	0.7316	(40)
HLP (average)												0.7250	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.8642 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
72.2437	71.1580	69.5759	66.5490	64.3151	61.8240	60.4080	61.9781	63.6992	66.3739	69.4659	71.9669	(42a)

Hot water usage for baths

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
31.1904	30.7271	30.0748	28.8721	27.9715	26.9729	26.4334	27.0812	27.7865	28.8550	30.0826	31.0849	(42b)

Hot water usage for other uses

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
43.9627	42.3640	40.7654	39.1667	37.5681	35.9694	35.9694	37.5681	39.1667	40.7654	42.3640	43.9627	(42c)

Average daily hot water use (litres/day)	135.4907 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	147.3967	144.2491	140.4161	134.5878	129.8547	124.7663	122.8109	126.6274	130.6524	135.9943	141.9125	147.0144	(44)
Energy conte	233.4403	205.4088	215.8143	184.2439	174.8094	153.4147	148.5292	156.7911	161.1075	184.5430	202.1803	230.1891	(45)
Energy content (annual)										Total = Sum(45)m =		2250.4717	
Distribution loss (46)m = 0.15 x (45)m													
	35.0160	30.8113	32.3722	27.6366	26.2214	23.0122	22.2794	23.5187	24.1661	27.6815	30.3271	34.5284	(46)
Water storage loss:													
Store volume												210.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5800	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8532	(55)
Total storage loss													
	26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(56)
If cylinder contains dedicated solar storage													
	26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	283.1519	250.3096	265.5259	232.3519	224.5210	201.5227	198.2408	206.5027	209.2155	234.2546	250.2883	279.9007	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	283.1519	250.3096	265.5259	232.3519	224.5210	201.5227	198.2408	206.5027	209.2155	234.2546	250.2883	279.9007	(64)
										Total per year (kWh/year) = Sum(64)m =		2835.7857	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
						Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =						0.0000	(64a)
Heat gains from water heating, kWh/month													
	117.3882	104.2191	111.5276	99.7475	97.8934	89.4968	89.1552	91.9023	92.0546	101.1298	105.7114	116.3071	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	41.8620	37.1814	30.2380	22.8921	17.1121	14.4468	15.6102	20.2908	27.2342	34.5801	40.3601	43.0254	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	426.1571	430.5793	419.4356	395.7119	365.7649	337.6190	318.8159	314.3937	325.5374	349.2611	379.2081	407.3540	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	(71)
Water heating gains (Table 5)													
	157.7798	155.0879	149.9026	138.5382	131.5771	124.3011	119.8323	123.5246	127.8537	135.9272	146.8213	156.3268	(72)
Total internal gains													
	738.1333	735.1831	711.9106	669.4765	626.7886	588.7013	566.5928	570.5435	592.9597	632.1028	678.7239	719.0406	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	2.3600	8.9975	0.3000	0.0000	0.7700	4.9051	(74)
East	5.8000	16.6187	0.3000	0.0000	0.7700	22.2657	(76)
West	2.8100	16.6187	0.3000	0.0000	0.7700	10.7874	(80)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	37.9581	77.7717	135.6273	203.7977	247.6756	260.1689	242.0464	202.3342	160.1784	95.9917	49.0872	33.4363	(83)
Total gains	776.0915	812.9547	847.5378	873.2742	874.4642	848.8702	808.6392	772.8777	753.1382	728.0946	727.8111	752.4769	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	28.1550	28.3311	28.3311	29.0583	28.8730	29.8238	30.2219	30.2219	29.8238	29.0583	29.0583	28.8730	
alpha	2.8770	2.8887	2.8887	2.9372	2.9249	2.9883	3.0148	3.0148	2.9883	2.9372	2.9372	2.9249	
util living area													
	0.9180	0.9019	0.8718	0.8016	0.6936	0.5414	0.4328	0.4586	0.6502	0.8159	0.8910	0.9227	(86)
Living	19.2082	19.4023	19.7133	20.2286	20.6213	20.8759	20.9519	20.9425	20.7638	20.2888	19.7293	19.2148	
Non living	18.6403	18.8334	19.1370	19.6460	20.0090	20.2478	20.3142	20.3080	20.1568	19.7094	19.1685	18.6587	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.0834	19.4023	19.7133	20.2286	20.6213	20.8759	20.9519	20.9425	20.7638	20.2888	19.7293	19.4645	(87)
Th 2	20.2967	20.3008	20.3008	20.3171	20.3130	20.3336	20.3418	20.3418	20.3336	20.3171	20.3171	20.3130	(88)
util rest of house													
	0.9101	0.8924	0.8591	0.7812	0.6603	0.4932	0.3748	0.3997	0.6076	0.7934	0.8792	0.9153	(89)
MIT 2	19.4493	18.8334	19.1370	19.6460	20.0090	20.2478	20.3142	20.3080	20.1568	19.7094	19.1685	18.8901	(90)
Living area fraction										fLA = Living area / (4) =		0.2917	(91)
MIT	19.6343	18.9994	19.3052	19.8159	20.1877	20.4311	20.5002	20.4931	20.3339	19.8784	19.3321	19.0577	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6343	18.9994	19.3052	19.8159	20.1877	20.4311	20.5002	20.4931	20.3339	19.8784	19.3321	19.0577	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9017	0.8715	0.8382	0.7648	0.6538	0.5005	0.3891	0.4136	0.6076	0.7771	0.8591	0.8992	(94)
Useful gains	699.7813	708.4974	710.4480	667.8565	571.7563	424.8745	314.6078	319.6611	457.6190	565.8347	625.2667	676.5987	(95)
Ext temp.	4.7000	5.3000	6.7000	9.3000	12.3000	15.0000	16.6000	16.5000	14.1000	10.8000	7.5000	4.6000	(96)

Heat loss rate W

1347.1777	1228.0942	1130.0031	919.1217	693.8260	462.5075	327.7657	335.5698	530.8737	793.4777	1034.1596	1271.7482	(97)

Space heating kWh

481.6630	349.1690	312.1490	180.9109	90.8199	0.0000	0.0000	0.0000	0.0000	169.3664	294.4029	442.7912	(98a)

Space heating requirement - total per year (kWh/year) 2321.2723

Solar heating kWh

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)

Solar heating contribution - total per year (kWh/year) 0.0000

Space heating kWh

481.6630	349.1690	312.1490	180.9109	90.8199	0.0000	0.0000	0.0000	0.0000	169.3664	294.4029	442.7912	(98c)

Space heating requirement after solar contribution - total per year (kWh/year) 2321.2723

Space heating per m2 (98c) / (4) = 19.3053 (99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (201)

Fraction of space heat from main system(s) 1.0000 (202)

Efficiency of main space heating system 1 (in %) 280.5326 (206)

Efficiency of main space heating system 2 (in %) 0.0000 (207)

Efficiency of secondary/supplementary heating system, % 0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	481.6630	349.1690	312.1490	180.9109	90.8199	0.0000	0.0000	0.0000	0.0000	169.3664	294.4029	442.7912	(98)
Space heating efficiency (main heating system 1)													
	280.5326	280.5326	280.5326	280.5326	280.5326	0.0000	0.0000	0.0000	0.0000	280.5326	280.5326	280.5326	(210)
Space heating fuel (main heating system)													
	171.6959	124.4665	111.2701	64.4884	32.3741	0.0000	0.0000	0.0000	0.0000	60.3732	104.9443	157.8395	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	283.1519	250.3096	265.5259	232.3519	224.5210	201.5227	198.2408	206.5027	209.2155	234.2546	250.2883	279.9007	(64)
Efficiency of water heater												279.7193	(216)
(217)m	279.7193	279.7193	279.7193	279.7193	279.7193	279.7193	279.7193	279.7193	279.7193	279.7193	279.7193	279.7193	(217)
Fuel for water heating, kWh/month													
	101.2272	89.4860	94.9259	83.0661	80.2665	72.0446	70.8713	73.8250	74.7948	83.7463	89.4784	100.0649	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	45.0156	40.6593	45.0156	43.5635	45.0156	43.5635	45.0156	45.0156	43.5635	45.0156	43.5635	45.0156	(231)
Lighting	36.6415	29.3952	26.4671	19.3909	14.9781	12.2373	13.6635	17.7604	23.0690	30.2678	34.1874	37.6599	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year

Space heating fuel - main system 1 827.4518 (211)

Space heating fuel - main system 2 0.0000 (213)

Space heating fuel - secondary 0.0000 (215)

Efficiency of water heater 279.7193

Water heating fuel used 1013.7971 (219)

Space cooling fuel 0.0000 (221)

Electricity for pumps and fans:

(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.3580)

mechanical ventilation fans (SFP = 1.3580) 530.0227 (230a)

Total electricity for the above, kWh/year 530.0227 (231)

Electricity for lighting (calculated in Appendix L) 295.7182 (232)

Energy saving/generation technologies (Appendices M ,N and Q)

PV generation 0.0000 (233)

Wind generation 0.0000 (234)

Hydro-electric generation (Appendix N) 0.0000 (235a)

Electricity generated - Micro CHP (Appendix N) 0.0000 (235)

Appendix Q - special features

Energy saved or generated -0.0000 (236)

Energy used 0.0000 (237)

Total delivered energy for all uses 2666.9898 (238)

10a. Fuel costs - using BEDF prices (583)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	827.4518	28.4300	235.2446	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1013.7971	28.4300	288.2225	(247)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(247a)
Pumps, fans and electric keep-hot	530.0227	28.4300	150.6855	(249)
Energy for lighting	295.7182	28.4300	84.0727	(250)
Additional standing charges			0.0000	(251)
Total energy cost			758.2252	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy	Emission factor	Emissions	

	kWh/year	kg CO2/kWh	kg CO2/year	
Space heating - main system 1	827.4518	0.1549	128.2058	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1013.7971	0.1410	142.9318	(264)
Space and water heating			271.1376	(265)
Pumps, fans and electric keep-hot	530.0227	0.1387	73.5207	(267)
Energy for lighting	295.7182	0.1443	42.6813	(268)
Total CO2, kg/year			387.3396	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	827.4518	1.5736	1302.0898	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1013.7971	1.5213	1542.3116	(278)
Space and water heating			2844.4014	(279)
Pumps, fans and electric keep-hot	530.0227	1.5128	801.8183	(281)
Energy for lighting	295.7182	1.5338	453.5824	(282)
Total Primary energy kWh/year			4099.8021	(286)

SAP 10 EPC IMPROVEMENTS

001

Current energy efficiency rating: B 84
Current environmental impact rating: A 97

N Solar water heating		Recommended
U Solar photovoltaic panels		Recommended
V2 Wind turbine		Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
N Solar water heating	+ 1.2	-£ 54	-23 kg (6.0%)
U Solar photovoltaic panels	+ 6.9	-£ 289	-207 kg (56.8%)

	Typical annual savings		Energy efficiency	Environmental impact
Recommended measures				
Solar water heating	£54	0.19 kg/m²	B 85	A 97
Solar photovoltaic panels	£289	1.72 kg/m²	A 92	A 99
Total Savings	£342	1.91 kg/m²		

Potential energy efficiency rating: A 92
Potential environmental impact rating: A 99

Fuel prices for cost data on this page from database revision number 583 TEST (01 Oct 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, West Pennines (England)):

	Current	Potential	Saving
Electricity	£758	£705	£54
Space heating	£386	£412	-£26
Water heating	£288	£209	£79
Lighting	£84	£84	£0
Generated (PV)	-£0	-£289	£289
Total cost of fuels	£758	£416	£343
Total cost of uses	£758	£416	£342
Delivered energy	22 kWh/m²	7 kWh/m²	15 kWh/m²
Carbon dioxide emissions	0.4 tonnes	0.2 tonnes	0.2 tonnes
CO2 emissions per m²	3 kg/m²	1 kg/m²	2 kg/m²
Primary energy	34 kWh/m²	18 kWh/m²	16 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.0600 (1b)	x	2.4800 (2b)	=	116.7088	(1b) - (3b)
First floor	49.7800 (1c)	x	2.7800 (2c)	=	138.3884	(1c) - (3c)
Second floor	23.4000 (1d)	x	2.7700 (2d)	=	64.8180	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	120.2400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	319.9152	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)

Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.2500 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2125 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2709	0.2656	0.2603	0.2338	0.2284	0.2019	0.2019	0.1966	0.2125	0.2284	0.2391	0.2497	(22b)

Balanced mechanical ventilation with heat recovery		
If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =		80.1000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.3704	0.3651	0.3598	0.3332	0.3279	0.3014	0.3014	0.2961	0.3120	0.3279	0.3386	0.3492	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Door			4.1400	1.0000	4.1400			(26)
Window			10.9700	0.7752	8.5039			(27)
GF			47.0600	0.0900	4.2354	75.0000	3529.5000	(28a)
Exposed Floor			2.7200	0.1400	0.3808	20.0000	54.4000	(28b)
Main	136.0800	15.1100	120.9700	0.1300	15.7261	9.0000	1088.7300	(29a)
Dwarf Wall (PIRx0.72)	16.7700		16.7700	0.0900	1.5093	9.0000	150.9300	(29a)
PIJ	15.5100		15.5100	0.1300	2.0163	9.0000	139.5900	(30)
PIR	12.2300		12.2300	0.1300	1.5899	9.0000	110.0700	(30)
Residual Ceiling	26.3800		26.3800	0.0900	2.3742	9.0000	237.4200	(30)
Total net area of external elements Aum(A, m2)			256.7500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		40.4759			(33)
Main dwelling								
Party Wall 1			40.6300	0.0000	0.0000	20.0000	812.6000	(32)
Timber			124.1700			9.0000	1117.5300	(32c)
FF			47.0600			18.0000	847.0800	(32d)
SF			23.4000			18.0000	421.2000	(32d)
GF			47.0600			9.0000	423.5400	(32e)
FF			23.4000			9.0000	210.6000	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	9143.1900 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		76.0412 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	10.6900	0.1150	1.2293
E3 Sill	10.6900	0.0170	0.1817
E4 Jamb	35.4000	0.0940	3.3276
E5 Ground floor (normal)	22.8600	0.0670	1.5316
E11 Eaves (insulation at rafter level)	18.1000	0.0250	0.4525
E16 Corner (normal)	29.0400	0.0680	1.9747
E12 Gable (insulation at ceiling level)	5.6600	0.0770	0.4358
E6 Intermediate floor within a dwelling	39.5500	0.0320	1.2656
E17 Corner (inverted - internal area greater than external area)	2.4800	-0.0290	-0.0719
P1 Party wall - Ground floor	6.2400	0.3200	1.9968
E20 Exposed floor (normal)	3.3800	0.0790	0.2670
E21 Exposed floor (inverted)	3.3800	0.0630	0.2129
E13 Gable (insulation at rafter level)	8.2800	0.0740	0.6127
E18 Party wall between dwellings	5.5600	0.0920	0.5115
R6 Flat ceiling	18.1000	-0.0430	-0.7783
E25 Staggered party wall between dwellings	4.9600	0.0560	0.2778

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		13.4275 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	53.9034 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	39.1078	38.5470	37.9861	35.1819	34.6210	31.8168	31.8168	31.2559	32.9385	34.6210	35.7427	36.8644	(38)
Heat transfer coeff	93.0112	92.4503	91.8895	89.0852	88.5244	85.7201	85.7201	85.1593	86.8418	88.5244	89.6461	90.7678	(39)
Average = Sum(39)m / 12 =												88.9450	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7735	0.7689	0.7642	0.7409	0.7362	0.7129	0.7129	0.7082	0.7222	0.7362	0.7456	0.7549	(40)
HLP (average)												0.7397	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.8642 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	72.2437	71.1580	69.5759	66.5490	64.3151	61.8240	60.4080	61.9781	63.6992	66.3739	69.4659	71.9669	(42a)
Hot water usage for baths	31.1904	30.7271	30.0748	28.8721	27.9715	26.9729	26.4334	27.0812	27.7865	28.8550	30.0826	31.0849	(42b)
Hot water usage for other uses	43.9627	42.3640	40.7654	39.1667	37.5681	35.9694	35.9694	37.5681	39.1667	40.7654	42.3640	43.9627	(42c)
Average daily hot water use (litres/day)												135.4907	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use												

	147.3967	144.2491	140.4161	134.5878	129.8547	124.7663	122.8109	126.6274	130.6524	135.9943	141.9125	147.0144	(44)
Energy conte	233.4403	205.4088	215.8143	184.2439	174.8094	153.4147	148.5292	156.7911	161.1075	184.5430	202.1803	230.1891	(45)
Energy content (annual)											Total = Sum(45)m =	2250.4717	
Distribution loss (46)m = 0.15 x (45)m													
	35.0160	30.8113	32.3722	27.6366	26.2214	23.0122	22.2794	23.5187	24.1661	27.6815	30.3271	34.5284	(46)
Water storage loss:													
Store volume												210.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5800	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8532	(55)
Total storage loss													
	26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(56)
If cylinder contains dedicated solar storage													
	17.0031	15.3576	17.0031	16.4546	17.0031	16.4546	17.0031	17.0031	16.4546	17.0031	16.4546	17.0031	(57)
Primary loss	23.2624	21.0112	21.8667	15.7584	10.4681	9.9053	10.2355	11.1660	17.1091	21.8667	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	273.7058	241.7776	254.6841	216.4569	202.2805	179.7746	175.7677	184.9602	194.6712	223.4127	241.1469	270.4545	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Aperture area of solar collector												3.0000	(H1)
Zero-loss collector efficiency												0.8000	(H2)
Collector linear heat loss coefficient												1.8000	(H3)
Collector 2nd order heat loss coefficient												0.0000	(H4)
Collector loop efficiency												0.9000	(H5)
Incidence angle modifier												1.0000	(H6)
Overshading factor												0.8000	(H8)
Overall heat loss coefficient of system												6.5000	(H10)
Heat loss coefficient of collector loop												3.9667	(H11)
Dedicated solar storage volume												75.0000	(H12)
If combined cylinder, total volume of cylinder												210.0000	(H13)
Effective solar volume												115.5000	(H14)
Reference volume												225.0000	(H15)
Storage tank correction coefficient												1.1814	(H16)
Heat delivered to hot water												661.7243	(H24)
Heat delivered to space heating												0.0000	(H29)
Solar input												661.7243	
Solar input	-0.0000	-20.2144	-62.8139	-84.6635	-109.0628	-100.4582	-99.7212	-87.9174	-62.1691	-33.3828	-1.3210	-0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	273.7058	221.5632	191.8702	131.7934	93.2177	79.3164	76.0465	97.0428	132.5020	190.0299	239.8259	270.4545	(64)
										Total per year (kWh/year) = Sum(64)m =		1997.3683	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	109.8313	97.3935	102.8540	87.0315	80.1010	72.0983	71.1768	74.6683	80.4192	92.4563	98.3982	108.7502	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	41.8620	37.1814	30.2380	22.8921	17.1121	14.4468	15.6102	20.2908	27.2342	34.5801	40.3601	43.0254	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	426.1571	430.5793	419.4356	395.7119	365.7649	337.6190	318.8159	314.3937	325.5374	349.2611	379.2081	407.3540	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	(71)
Water heating gains (Table 5)													
	147.6227	144.9308	138.2447	120.8771	107.6627	100.1365	95.6677	100.3606	111.6933	124.2693	136.6642	146.1697	(72)
Total internal gains													
	727.9762	725.0259	700.2526	651.8154	602.8741	564.5367	542.4282	547.3794	576.7994	620.4449	668.5668	708.8835	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	2.3600	10.6334	0.3000	0.0000	0.7700	5.7969	(74)
East	5.8000	19.6403	0.3000	0.0000	0.7700	26.3140	(76)
West	2.8100	19.6403	0.3000	0.0000	0.7700	12.7487	(80)

Solar gains	44.8596	87.4931	144.6691	213.7738	265.6632	273.8620	259.9249	220.6005	168.9956	103.8599	55.8578	36.9559	(83)
Total gains	772.8358	812.5190	844.9217	865.5892	868.5373	838.3986	802.3530	767.9799	745.7950	724.3048	724.4246	745.8393	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	27.3061	27.4718	27.6395	28.5095	28.6901	29.6287	29.6287	29.8238	29.2460	28.6901	28.3311	27.9810	
alpha	2.8204	2.8315	2.8426	2.9006	2.9127	2.9752	2.9752	2.9883	2.9497	2.9127	2.8887	2.8654	
util living area													
	0.9246	0.9093	0.8787	0.8187	0.7242	0.5758	0.4423	0.4742	0.6603	0.8258	0.9006	0.9298	(86)
Living	19.0392	19.2435	19.6146	20.1230	20.5375	20.8413	20.9464	20.9335	20.7442	20.2323	19.5932	19.0387	
Non living	18.4596	18.6630	19.0293	19.5362	19.9296	20.2162	20.2987	20.2939	20.1298	19.6497	19.0239	18.4708	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	19.9969	19.2435	19.6146	20.1230	20.5375	20.8413	20.9464	20.9335	20.7442	20.2323	19.5932	19.3131	(87)
Th 2	20.2763	20.2804	20.2845	20.3048	20.3089	20.3294	20.3294	20.3336	20.3212	20.3089	20.3008	20.2926	(88)
util rest of house													
	0.9173	0.9005	0.8665	0.7998	0.6939	0.5297	0.3825	0.4148	0.6173	0.8042	0.8897	0.9229	(89)
MIT 2	19.3470	18.6630	19.0293	19.5362	19.9296	20.2162	20.2987	20.2939	20.1298	19.6497	19.0239	18.7256	(90)
Living area fraction											fLA = Living area / (4) =	0.2917	(91)

MIT	19.5366	18.8324	19.2000	19.7074	20.1069	20.3986	20.4877	20.4805	20.3090	19.8197	19.1900	18.8970	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5366	18.8324	19.2000	19.7074	20.1069	20.3986	20.4877	20.4805	20.3090	19.8197	19.1900	18.8970	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9088	0.8792	0.8450	0.7818	0.6844	0.5346	0.3970	0.4283	0.6165	0.7870	0.8691	0.9068	(94)
Useful gains	702.3417	714.3397	713.9400	676.6849	594.4693	448.2229	318.5362	328.9176	459.7673	570.0488	629.6120	676.3478	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1417.1747	1288.0542	1166.9985	962.7798	744.2188	497.0533	333.2508	347.4940	539.2051	816.1652	1083.8185	1334.0167	(97)
Space heating kWh													
	531.8358	385.5362	337.0756	205.9883	111.4137	0.0000	0.0000	0.0000	0.0000	183.1106	327.0287	489.3056	(98a)
Space heating requirement - total per year (kWh/year)												2571.2944	
Solar heating kWh													
	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	531.8358	385.5362	337.0756	205.9883	111.4137	0.0000	0.0000	0.0000	0.0000	183.1106	327.0287	489.3056	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2571.2944	
Space heating per m2											(98c) / (4) =	21.3847	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												281.3941	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	531.8358	385.5362	337.0756	205.9883	111.4137	0.0000	0.0000	0.0000	0.0000	183.1106	327.0287	489.3056	(98)
Space heating efficiency (main heating system 1)													
	281.3941	281.3941	281.3941	281.3941	281.3941	0.0000	0.0000	0.0000	0.0000	281.3941	281.3941	281.3941	(210)
Space heating fuel (main heating system)													
	189.0004	137.0093	119.7877	73.2028	39.5935	0.0000	0.0000	0.0000	0.0000	65.0727	116.2173	173.8862	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	273.7058	221.5632	191.8702	131.7934	93.2177	79.3164	76.0465	97.0428	132.5020	190.0299	239.8259	270.4545	(64)
Efficiency of water heater												279.7109	(216)
(217)m	279.7109	279.7109	279.7109	279.7109	279.7109	279.7109	279.7109	279.7109	279.7109	279.7109	279.7109	279.7109	(217)
Fuel for water heating, kWh/month													
	97.8531	79.2115	68.5959	47.1177	33.3265	28.3566	27.1875	34.6939	47.3711	67.9380	85.7406	96.6907	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	51.8101	46.7963	51.8101	50.1389	51.8101	50.1389	51.8101	51.8101	50.1389	51.8101	50.1389	51.8101	(231)
Lighting	36.6415	29.3952	26.4671	19.3909	14.9781	12.2373	13.6635	17.7604	23.0690	30.2678	34.1874	37.6599	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-38.4340	-57.4073	-86.8901	-101.3466	-110.7603	-101.0514	-99.8726	-93.0709	-80.9461	-66.7797	-43.0804	-32.7401	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-11.6525	-26.1727	-55.4562	-89.4254	-124.9225	-130.6623	-128.7789	-106.7030	-75.5170	-40.0662	-16.3294	-9.1737	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	913.7699	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	279.7109	
Water heating fuel used	714.0831	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.3580)		
mechanical ventilation fans (SFP = 1.3580)	530.0227	(230a)
pump for solar water heating	80.0000	(230g)
Total electricity for the above, kWh/year	610.0227	(231)
Electricity for lighting (calculated in Appendix L)	295.7182	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1727.2394	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	806.3545	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	913.7699	16.4900	150.6807	(240)

Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	714.0831	16.4900	117.7523	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	530.0227	16.4900	87.4007	(249)
Pump for solar water heating	80.0000	16.4900	13.1920	(249)
Energy for lighting	295.7182	16.4900	48.7639	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-912.3797	16.4900	-150.4514	
PV Unit electricity exported	-814.8597	5.5900	-45.5507	
Total			-196.0021	(252)
Total energy cost			221.7876	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.4832	(257)
SAP value		92.1674	
SAP rating (Section 12)		92	(258)
SAP band		A	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	913.7699	0.1548	141.4926	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	714.0831	0.1460	104.2886	(264)
Space and water heating			245.7811	(265)
Pumps, fans and electric keep-hot	610.0227	0.1387	84.6177	(267)
Energy for lighting	295.7182	0.1443	42.6813	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-912.3797	0.1340	-122.2922	
PV Unit electricity exported	-814.8597	0.1237	-100.7827	
Total			-223.0750	(269)
Total CO2, kg/year			150.0051	(272)
CO2 emissions per m2			1.2500	(273)
EI value			98.7835	
EI rating			99	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.0600	(1b) x	2.4800	(2b) =	116.7088	(1b) - (3b)
First floor	49.7800	(1c) x	2.7800	(2c) =	138.3884	(1c) - (3c)
Second floor	23.4000	(1d) x	2.7700	(2d) =	64.8180	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	120.2400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		319.9152	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.2500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2125	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.6000	4.5000	4.5000	4.1000	4.2000	3.7000	3.5000	3.5000	3.7000	4.1000	4.1000	4.2000	(22)
Wind factor	1.1500	1.1250	1.1250	1.0250	1.0500	0.9250	0.8750	0.8750	0.9250	1.0250	1.0250	1.0500	(22a)
Adj infilt rate	0.2444	0.2391	0.2391	0.2178	0.2231	0.1966	0.1859	0.1859	0.1966	0.2178	0.2178	0.2231	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 80.1000 (23c)

Effective ac	0.3439	0.3386	0.3386	0.3173	0.3226	0.2961	0.2854	0.2854	0.2961	0.3173	0.3173	0.3226	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Door			4.1400	1.0000	4.1400			(26)
Window			10.9700	0.7752	8.5039			(27)
GF			47.0600	0.0900	4.2354	75.0000	3529.5000	(28a)
Exposed Floor			2.7200	0.1400	0.3808	20.0000	54.4000	(28b)
Main	136.0800	15.1100	120.9700	0.1300	15.7261	9.0000	1088.7300	(29a)
Dwarf Wall (PIRx0.72)	16.7700		16.7700	0.0900	1.5093	9.0000	150.9300	(29a)
PIJ	15.5100		15.5100	0.1300	2.0163	9.0000	139.5900	(30)
PIR	12.2300		12.2300	0.1300	1.5899	9.0000	110.0700	(30)
Residual Ceiling	26.3800		26.3800	0.0900	2.3742	9.0000	237.4200	(30)
Total net area of external elements Aum(A, m2)			256.7500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		40.4759			(33)
Main dwelling								
Party Wall 1			40.6300	0.0000	0.0000	20.0000	812.6000	(32)
Timber			124.1700			9.0000	1117.5300	(32c)
FF			47.0600			18.0000	847.0800	(32d)
SF			23.4000			18.0000	421.2000	(32d)
GF			47.0600			9.0000	423.5400	(32e)
FF			23.4000			9.0000	210.6000	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 9143.1900 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 76.0412 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	10.6900	0.1150	1.2293
E3 Sill	10.6900	0.0170	0.1817
E4 Jamb	35.4000	0.0940	3.3276
E5 Ground floor (normal)	22.8600	0.0670	1.5316
E11 Eaves (insulation at rafter level)	18.1000	0.0250	0.4525
E16 Corner (normal)	29.0400	0.0680	1.9747
E12 Gable (insulation at ceiling level)	5.6600	0.0770	0.4358
E6 Intermediate floor within a dwelling	39.5500	0.0320	1.2656
E17 Corner (inverted - internal area greater than external area)	2.4800	-0.0290	-0.0719
P1 Party wall - Ground floor	6.2400	0.3200	1.9968
E20 Exposed floor (normal)	3.3800	0.0790	0.2670
E21 Exposed floor (inverted)	3.3800	0.0630	0.2129
E13 Gable (insulation at rafter level)	8.2800	0.0740	0.6127
E18 Party wall between dwellings	5.5600	0.0920	0.5115
R6 Flat ceiling	18.1000	-0.0430	-0.7783
E25 Staggered party wall between dwellings	4.9600	0.0560	0.2778

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 13.4275 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 53.9034 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	36.3036	35.7427	35.7427	33.4993	34.0602	31.2559	30.1342	30.1342	31.2559	33.4993	33.4993	34.0602	(38)
Heat transfer coeff	90.2069	89.6461	89.6461	87.4027	87.9635	85.1593	84.0376	84.0376	85.1593	87.4027	87.4027	87.9635	(39)
Average = Sum(39)m / 12 =												87.1690	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7502	0.7456	0.7456	0.7269	0.7316	0.7082	0.6989	0.6989	0.7082	0.7269	0.7269	0.7316	(40)
HLP (average)												0.7250	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.8642 (42)
Hot water usage for mixer showers

72.2437	71.1580	69.5759	66.5490	64.3151	61.8240	60.4080	61.9781	63.6992	66.3739	69.4659	71.9669	(42a)

Hot water usage for baths

31.1904	30.7271	30.0748	28.8721	27.9715	26.9729	26.4334	27.0812	27.7865	28.8550	30.0826	31.0849	(42b)

Hot water usage for other uses

43.9627	42.3640	40.7654	39.1667	37.5681	35.9694	35.9694	37.5681	39.1667	40.7654	42.3640	43.9627	(42c)

Average daily hot water use (litres/day) 135.4907 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	147.3967	144.2491	140.4161	134.5878	129.8547	124.7663	122.8109	126.6274	130.6524	135.9943	141.9125	147.0144	(44)
Energy conte	233.4403	205.4088	215.8143	184.2439	174.8094	153.4147	148.5292	156.7911	161.1075	184.5430	202.1803	230.1891	(45)
Energy content (annual)										Total = Sum(45)m =		2250.4717	
Distribution loss (46)m = 0.15 x (45)m	35.0160	30.8113	32.3722	27.6366	26.2214	23.0122	22.2794	23.5187	24.1661	27.6815	30.3271	34.5284	(46)
Water storage loss:													
Store volume												210.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5800	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8532	(55)
Total storage loss	26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(56)
If cylinder contains dedicated solar storage	17.0031	15.3576	17.0031	16.4546	17.0031	16.4546	17.0031	17.0031	16.4546	17.0031	16.4546	17.0031	(57)
Primary loss	23.2624	21.0112	21.8667	15.7584	10.4681	9.9053	10.2355	11.1660	17.1091	21.8667	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	273.7058	241.7776	254.6841	216.4569	202.2805	179.7746	175.7677	184.9602	194.6712	223.4127	241.1469	270.4545	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)

Aperture area of solar collector 3.0000 (H1)
Zero-loss collector efficiency 0.8000 (H2)
Collector linear heat loss coefficient 1.8000 (H3)
Collector 2nd order heat loss coefficient 0.0000 (H4)
Collector loop efficiency 0.9000 (H5)
Incidence angle modifier 1.0000 (H6)
Overshading factor 0.8000 (H8)

Overall heat loss coefficient of system												6.5000	(H10)
Heat loss coefficient of collector loop												3.9667	(H11)
Dedicated solar storage volume												75.0000	(H12)
If combined cylinder, total volume of cylinder												210.0000	(H13)
Effective solar volume												115.5000	(H14)
Reference volume												225.0000	(H15)
Storage tank correction coefficient												1.1814	(H16)
Heat delivered to hot water												605.2985	(H24)
Heat delivered to space heating												0.0000	(H29)
Solar input												605.2985	
Solar input	-0.0000	-14.4753	-57.1346	-80.0537	-101.5431	-95.3649	-92.1367	-79.1730	-57.3788	-28.0385	-0.0000	-0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	273.7058	227.3023	197.5495	136.4032	100.7374	84.4097	83.6309	105.7872	137.2924	195.3743	241.1469	270.4545	(64)
										Total per year (kWh/year) = Sum(64)m =		2053.7941	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	109.8313	97.3935	102.8540	87.0315	80.1010	72.0983	71.1768	74.6683	80.4192	92.4563	98.3982	108.7502	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	41.8620	37.1814	30.2380	22.8921	17.1121	14.4468	15.6102	20.2908	27.2342	34.5801	40.3601	43.0254	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	426.1571	430.5793	419.4356	395.7119	365.7649	337.6190	318.8159	314.3937	325.5374	349.2611	379.2081	407.3540	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	(71)
Water heating gains (Table 5)													
	147.6227	144.9308	138.2447	120.8771	107.6627	100.1365	95.6677	100.3606	111.6933	124.2693	136.6642	146.1697	(72)
Total internal gains													
	727.9762	725.0259	700.2526	651.8154	602.8741	564.5367	542.4282	547.3794	576.7994	620.4449	668.5668	708.8835	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	2.3600	8.9975	0.3000	0.0000	0.7700	4.9051	(74)
East	5.8000	16.6187	0.3000	0.0000	0.7700	22.2657	(76)
West	2.8100	16.6187	0.3000	0.0000	0.7700	10.7874	(80)

Solar gains	37.9581	77.7717	135.6273	203.7977	247.6756	260.1689	242.0464	202.3342	160.1784	95.9917	49.0872	33.4363	(83)
Total gains	765.9343	802.7976	835.8799	855.6131	850.5497	824.7056	784.4746	749.7136	736.9778	716.4366	717.6539	742.3197	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	28.1550	28.3311	28.3311	29.0583	28.8730	29.8238	30.2219	30.2219	29.8238	29.0583	29.0583	28.8730	
alpha	2.8770	2.8887	2.8887	2.9372	2.9249	2.9883	3.0148	3.0148	2.9883	2.9372	2.9372	2.9249	
util living area													
	0.9203	0.9044	0.8752	0.8082	0.7046	0.5534	0.4442	0.4705	0.6592	0.8210	0.8941	0.9249	(86)
Living	19.1902	19.3854	19.6958	20.2084	20.6041	20.8683	20.9484	20.9383	20.7544	20.2747	19.7129	19.1964	
Non living	18.6228	18.8170	19.1204	19.6274	19.9943	20.2423	20.3120	20.3054	20.1494	19.6965	19.1528	18.6408	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.0742	19.3854	19.6958	20.2084	20.6041	20.8683	20.9484	20.9383	20.7544	20.2747	19.7129	19.4487	(87)
Th 2	20.2967	20.3008	20.3008	20.3171	20.3130	20.3336	20.3418	20.3418	20.3336	20.3171	20.3171	20.3130	(88)
util rest of house													
	0.9125	0.8951	0.8627	0.7883	0.6716	0.5049	0.3852	0.4106	0.6167	0.7988	0.8825	0.9177	(89)
MIT 2	19.4404	18.8170	19.1204	19.6274	19.9943	20.2423	20.3120	20.3054	20.1494	19.6965	19.1528	18.8747	(90)
Living area fraction											fLA = Living area / (4) =	0.2917	(91)
MIT	19.6253	18.9828	19.2883	19.7969	20.1722	20.4249	20.4977	20.4901	20.3259	19.8652	19.3162	19.0422	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6253	18.9828	19.2883	19.7969	20.1722	20.4249	20.4977	20.4901	20.3259	19.8652	19.3162	19.0422	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9042	0.8743	0.8418	0.7714	0.6644	0.5118	0.3995	0.4245	0.6162	0.7823	0.8624	0.9017	(94)
Useful gains	692.5314	701.8657	703.6579	660.0434	565.1116	422.0625	313.4175	318.2542	454.1355	560.4385	618.9360	669.3669	(95)
Ext temp.	4.7000	5.3000	6.7000	9.3000	12.3000	15.0000	16.6000	16.5000	14.1000	10.8000	7.5000	4.6000	(96)
Heat loss rate W													
	1346.3658	1226.6106	1128.4923	917.4538	692.4684	461.9814	327.5515	335.3151	530.1931	792.3207	1032.7706	1270.3839	(97)
Space heating kWh													
	486.4528	352.6286	316.0768	185.3355	94.7535	0.0000	0.0000	0.0000	0.0000	172.5204	297.9609	447.1566	(98a)
Space heating requirement - total per year (kWh/year)												2352.8851	
Solar heating kWh													
	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	486.4528	352.6286	316.0768	185.3355	94.7535	0.0000	0.0000	0.0000	0.0000	172.5204	297.9609	447.1566	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2352.8851	
Space heating per m2											(98c) / (4) =	19.5682	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												280.5326	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	486.4528	352.6286	316.0768	185.3355	94.7535	0.0000	0.0000	0.0000	0.0000	172.5204	297.9609	447.1566	(98)
Space heating efficiency (main heating system 1)													
	280.5326	280.5326	280.5326	280.5326	280.5326	0.0000	0.0000	0.0000	0.0000	280.5326	280.5326	280.5326	(210)
Space heating fuel (main heating system)													
	173.4033	125.6997	112.6703	66.0656	33.7763	0.0000	0.0000	0.0000	0.0000	61.4974	106.2126	159.3956	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	273.7058	227.3023	197.5495	136.4032	100.7374	84.4097	83.6309	105.7872	137.2924	195.3743	241.1469	270.4545	(64)
Efficiency of water heater												279.7193	(216)
(217)m	279.7193	279.7193	279.7193	279.7193	279.7193	279.7193	279.7193	279.7193	279.7193	279.7193	279.7193	279.7193	(217)
Fuel for water heating, kWh/month													
	97.8502	81.2609	70.6242	48.7643	36.0138	30.1766	29.8982	37.8191	49.0822	69.8466	86.2103	96.6878	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	51.8101	46.7963	51.8101	50.1389	51.8101	50.1389	51.8101	51.8101	50.1389	51.8101	50.1389	51.8101	(231)
Lighting	36.6415	29.3952	26.4671	19.3909	14.9781	12.2373	13.6635	17.7604	23.0690	30.2678	34.1874	37.6599	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-33.1414	-52.0133	-82.6014	-97.7556	-105.7534	-98.2912	-96.1020	-88.5158	-78.2179	-62.8268	-38.5448	-29.9115	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-9.2395	-22.2800	-50.8483	-84.1137	-113.9717	-121.8368	-116.8222	-94.7163	-70.0819	-35.9247	-13.6639	-8.0106	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												838.7207	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												279.7193	
Water heating fuel used												734.2340	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.3580)													
mechanical ventilation fans (SFP = 1.3580)												530.0227	(230a)
pump for solar water heating												80.0000	(230g)
Total electricity for the above, kWh/year												610.0227	(231)
Electricity for lighting (calculated in Appendix L)												295.7182	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1605.1846	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												873.5110	(238)

10a. Fuel costs - using BEDF prices (583)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	838.7207	28.4300	238.4483	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	734.2340	28.4300	208.7427	(247)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(247a)
Pumps, fans and electric keep-hot	530.0227	28.4300	150.6855	(249)
Pump for solar water heating	80.0000	28.4300	22.7440	(249)
Energy for lighting	295.7182	28.4300	84.0727	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-863.6751	28.4300	-245.5428	
PV Unit electricity exported	-741.5095	5.8100	-43.0817	
Total			-288.6245	(252)
Total energy cost			416.0686	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	838.7207	0.1549	129.9043	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	734.2340	0.1456	106.9246	(264)
Space and water heating			236.8289	(265)
Pumps, fans and electric keep-hot	610.0227	0.1387	84.6177	(267)

Energy for lighting	295.7182	0.1443	42.6813	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-863.6751	0.1337	-115.4596	
PV Unit electricity exported	-741.5095	0.1234	-91.5392	
Total			-206.9988	(269)
Total CO2, kg/year			157.1291	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	838.7207	1.5734	1319.6461	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	734.2340	1.5387	1129.7567	(278)
Space and water heating			2449.4028	(279)
Pumps, fans and electric keep-hot	610.0227	1.5128	922.8423	(281)
Energy for lighting	295.7182	1.5338	453.5824	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-863.6751	1.4940	-1290.3644	
PV Unit electricity exported	-741.5095	0.4531	-335.9507	
Total			-1626.3151	(283)
Total Primary energy kWh/year			2199.5124	(286)

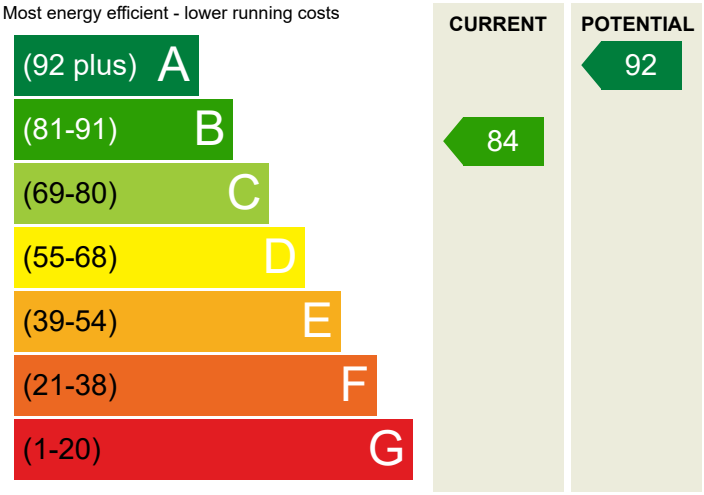
Energy Report

Dwelling Address	846 Rochdale Road, MANCHESTER, M9 8FA
Reference	78449-05-001
Assessment Date	02/07/2025
Submission Date	
Property Type	House, End-Terrace
Total Floor Area	120

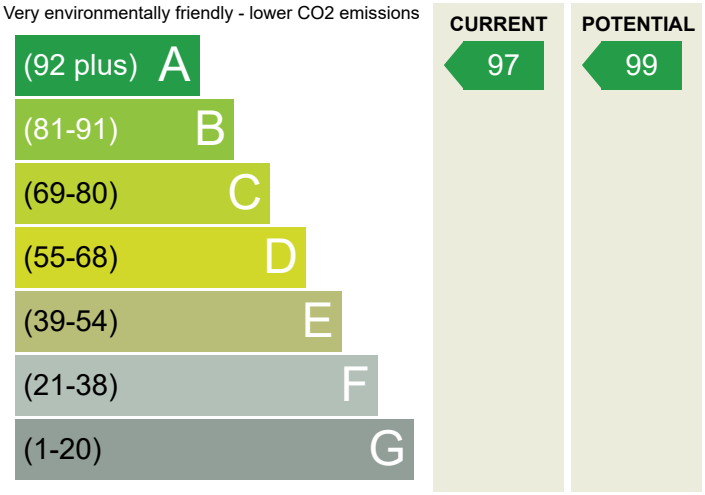
This Energy Report has been generated using the UK's National Calculation Methodology for dwellings, Standard Assessment Procedure (SAP). This methodology is used to assess the energy efficiency of dwellings which is calculated based on a dwelling's heating, hot water, ventilation and lighting usage.

This document is not an Energy Performance Certificate (EPC) as required by the Energy Performance of Buildings Regulations

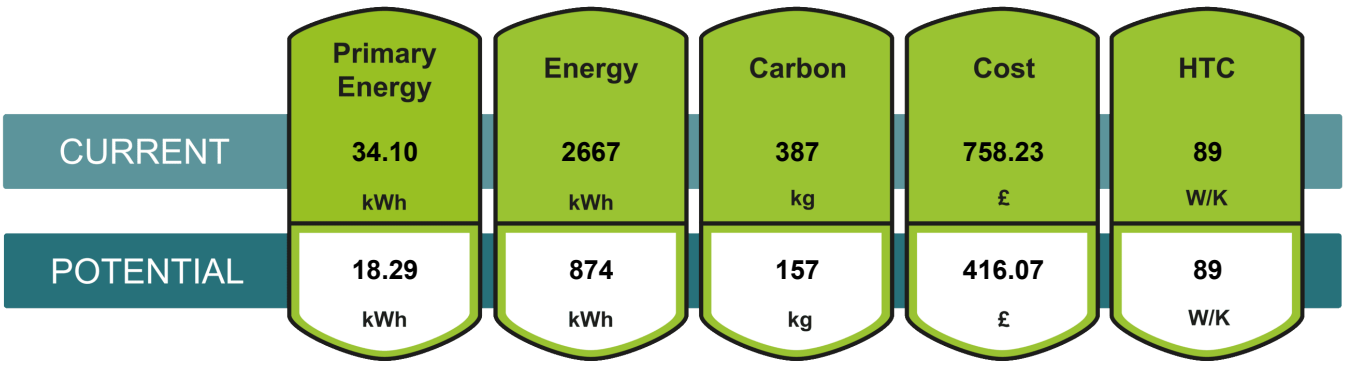
Energy Efficiency Rating



Carbon Dioxide (CO2) Emissions Rating



Additional ratings for your home



Energy Report

Breakdown of property's energy performance

Each feature is assessed as one of the following:

Very Poor | Poor | Average | Good | Very Good

Feature	Description	Energy Performance
Walls	Average thermal transmittance 0.13 W/m²K	Very Good
Roof	Average thermal transmittance 0.11 W/m²K	Very Good
Floor	Average thermal transmittance 0.09 W/m²K	Very Good
Windows	High performance glazing	Very Good
Main heating	Air source heat pump, radiators, electric	Good
Main heating controls	Programmer, room thermostat and TRVs	Good
Secondary heating	None	
Hot water	From main system	Good
Lighting	Good lighting efficiency	Good
Air tightness	Air permeability [AP50] = 5.0 m³/h.m² (as tested)	Good

Recommendations

The recommended measures provided below will help to improve the energy efficiency of the dwelling.
To reach the dwelling's potential energy rating all of the recommended measures shown below would need to be installed.
Having these measures installed individually or in any other order may give a different result when compared with the cumulative potential rating.

Recommended measures	Cumulative savings (per year)	Cumulative rating	Typical costs	Incremental savings (per year)	Cumulative CO2 rating
Solar water heating	£54	B 85	£4,000 - £7,000	£54	A 97
Photovoltaic	£342	A 92	£8,000 - £10,000	£289	A 99

Energy Report

The typical cost is based on average installation prices across the country so may not be representative of the actual costs in your area.

Estimated energy costs of the dwelling

The table below shows the estimated running costs of the space and water heating and lighting within the dwelling. It does not include the energy used from household appliances. The estimated annual costs after potential improvements indicates the total energy cost if all recommended measures named above were installed.

	Estimated annual costs	Estimated annual costs after potential improvements	Potential future savings
Lighting	£84	£84	
Heating	£386	£412	
Hot Water	£288	£209	
New Technologies e.g. Impact of PV	£0	-(£289)	
TOTAL	£758	£416	

Estimated energy use and potential savings

Space Heating
827
kWh per year

Water Heating
1014
kWh per year

Energy Report

About this document

Created by:	
Company/Trading name:	
Phone number:	
Email address:	

Disclaimer

This Energy Report should not under any circumstances be treated as a Condition Survey and cannot be used to indicate that any element of the dwelling (e.g.heating system) is working correctly.
This Energy Report must not be used in situations where an Energy Performance Certificate (EPC) is required.
This Energy Report is generated from a set of data inputs which may not reflect the actual dimensions, services or construction of the dwelling.
The calculation used to generate this report reflects the SAP Methodology current at the time of report generation.

Glossary terms for additional metrics

Primary Energy	The measure of the energy required for lighting, heating and hot water in a property. This includes the efficiency of the property's heating system, power station efficiency for electricity and the energy used to produce the fuel and deliver it to the property.
Energy Used	The estimated amount of fuel energy for lighting, heating and hot water for the property. The estimate is based on typical usage which is likely to be different to actual consumption.
Carbon (CO2)	The current emissions based on the energy estimates.
Cost	The estimated cost of energy. The cost of each unit of fuel is based on an industry standard which is likely to be different to those the occupier actually pays.
Heat Transfer Coefficient	Heat flow through the property envelope where internal and external temperatures are different.

Building Regulations England Part L (BREL) Compliance Report

Approved Document L1 2021 Edition, England assessed by Array SAP 10 program, Array

Date: Fri 03 Oct 2025 15:03:26

Project Information			
Assessed By	Paul Goddard	Building Type	House, Mid-terrace
OCDEA Registration	EES/005113	Assessment Date	2025-10-03

Dwelling Details			
Assessment Type	As built	Total Floor Area	91 m^2
Site Reference	78449-06	Plot Reference	001
Address	844 Rochdale Road, MANCHESTER, M9 8FA		

Client Details	
Name	-
Company	John Southworth
Address	Unit 10, Charles Street, DUKINFIELD, SK16 4SD

This report covers items included within the SAP calculations. It is not a complete report of regulations compliance.

1a Target emission rate and dwelling emission rate		
Fuel for main heating system	Electricity	
Target carbon dioxide emission rate	*11.59 $kgCO_2/m^2$*	
Dwelling carbon dioxide emission rate	3.63 $kgCO_2/m^2$	**OK**
1b Target primary energy rate and dwelling primary energy		
Target primary energy	*60.76 kWh_{PE}/m^2*	
Dwelling primary energy	38.42 kWh_{PE}/m^2	**OK**
1c Target fabric energy efficiency and dwelling fabric energy efficiency		
Target fabric energy efficiency	*37.6 kWh/m^2*	
Dwelling fabric energy efficiency	34.2 kWh/m^2	**OK**

2a Fabric U-values				
Element	***Maximum permitted average U-Value [W/m^2K]***	**Dwelling average U-Value [W/m^2K]**	**Element with highest individual U-Value**	
External walls	*0.26*	0.13	Walls (1) (0.13)	**OK**
Party walls	*0.2*	0	Party Wall (1) (0)	**N/A**
Curtain walls	*1.6*	0	N/A	**N/A**
Floors	*0.18*	0.1	Exposed Floor (0.14)	**OK**
Roofs	*0.16*	0.13	Roof (1) (0.13)	**OK**
Windows, doors, and roof windows	*1.6*	0.87	Front (1)	**OK**
Rooflights	*2.2*	N/A	N/A	**N/A**

2b Envelope elements (better than typically expected values are flagged with a subsequent (!))		
Name	**Net area [m^2]**	**U-Value [W/m^2K]**
Exposed wall: Walls (1)	59.2	0.13 **(!)**
Party wall: Party Wall (1)	81.22	0 **(!)**
Ground floor: GF, GF	41.18	0.09 **(!)**
Upper floor: Exposed Floor, Exposed Floor	8.6	0.14
Exposed roof: Roof (1)	49.779998779296875	0.13

2c Openings (better than typically expected values are flagged with a subsequent (!))				
Name	**Area [m^2]**	**Orientation**	**Frame factor**	**U-Value [W/m^2K]**
Front, Door	1.99	East	N/A	1 **(!)**
Front, Window	4.98	East	1.0	0.8 **(!)**
Rear, Window	3.53	West	1.0	0.8 **(!)**
Rear, Door	2.15	West	N/A	1 **(!)**

2d Thermal bridging (better than typically expected values are flagged with a subsequent (!))				
Building part **1**: Thermal bridging calculated from linear thermal transmittances for each junction				
Main element	**Junction detail**	**Source**	**Psi value [W/mK]**	**Drawing / reference**
External wall	E2: Other lintels (including other steel lintels)	Calculated by person with suitable expertise	0.115	Thermal Bridge Report

Main element	Junction detail	Source	Psi value [W/mK]	Drawing / reference
External wall	E3: Sill	Calculated by person with suitable expertise	0.017 **(!)**	Thermal Bridge Report
External wall	E4: Jamb	Calculated by person with suitable expertise	0.094	Thermal Bridge Report
External wall	E5: Ground floor (normal)	Calculated by person with suitable expertise	0.067	Thermal Bridge Report
External wall	E16: Corner (normal)	Calculated by person with suitable expertise	0.068	Thermal Bridge Report
External wall	E12: Gable (insulation at ceiling level)	Calculated by person with suitable expertise	0.077	Thermal Bridge Report
External wall	E6: Intermediate floor within a dwelling	Calculated by person with suitable expertise	0.032 **(!)**	Thermal Bridge Report
External wall	E17: Corner (inverted - internal area greater than external area)	Calculated by person with suitable expertise	-0.029 **(!)**	Thermal Bridge Report
Party wall	P1: Ground floor	SAP table default	0.32	K1
External wall	E20: Exposed floor (normal)	Calculated by person with suitable expertise	0.079	Thermal Bridge Report
External wall	E21: Exposed floor (inverted)	Calculated by person with suitable expertise	0.063	Thermal Bridge Report
External wall	E18: Party wall between dwellings	Calculated by person with suitable expertise	0.092	Thermal Bridge Report
Party wall	P4: Roof (insulation at ceiling level)	Calculated by person with suitable expertise	0.102	Thermal Bridge Report
External wall	E25: Staggered party wall between dwellings	Calculated by person with suitable expertise	0.056	Thermal Bridge Report

3 Air permeability (better than typically expected values are flagged with a subsequent (!))		
Maximum permitted air permeability at 50Pa	*8 m^3/hm^2*	
Dwelling air permeability at 50Pa	5 m^3/hm^2, Measured value	OK
Air permeability test certificate reference		

4 Space heating	
Main heating system 1: Heat pump with radiators or underfloor heating - Electricity	
Efficiency	270.9%
Emitter type	Radiators
Flow temperature	45°C
System type	
Manufacturer	Daikin Europe NV
Model	EDLA09DA3V3
Commissioning	
Secondary heating system: N/A	
Fuel	N/A
Efficiency	N/A
Commissioning	

5 Hot water	
Cylinder/store - type: Cylinder	
Capacity	210 litres
Declared heat loss	1.58 kWh/day
Primary pipework insulated	Yes
Manufacturer	
Model	
Commissioning	
Waste water heat recovery system 1 - type: N/A	
Efficiency	
Manufacturer	
Model	

6 Controls	
Main heating 1 - type: Programmer, room thermostat and TRVs	
Function	
Ecodesign class	
Manufacturer	
Model	

Water heating - type: Cylinder thermostat and HW separately timed	
Manufacturer	
Model	

7 Lighting		
Minimum permitted light source efficacy	*75 lm/W*	
Lowest light source efficacy	80 lm/W	OK
External lights control	N/A	

8 Mechanical ventilation		
System type: Balanced whole-house mechanical ventilation with heat recovery		
Maximum permitted specific fan power	*1.5 W/(l/s)*	
Specific fan power	0.85 W/(l/s)	OK
Minimum permitted heat recovery efficiency	*73%*	
Heat recovery efficiency	90%	OK
Manufacturer/Model	DV110 Adroit	
Commissioning		

9 Local generation
N/A

10 Heat networks
N/A

11 Supporting documentary evidence	
Documentary evidence identified in 11.1 and 11.2 is needed to confirm the data values used for any calculations undertaken, manufacturer declarations made, and tests performed as reflected in this "As built" BREL Compliance Report are correct. 11.1 SAP Conventions, Appendix 1 (documentary evidence) schedules the minimum documentary evidence required. 11.2 Indicative photographic evidence of key stages during construction (guidance within Approved Document L, Volume 1 – Appendix B) that confirms the products identified in this BREL Compliance Report are used in this dwelling, and workmanship is of sufficient quality to support the calculated values claimed in 2a to 2d.	

12 Declarations	
a. Assessor Declaration	
This declaration by the assessor is confirmation that the contents of this BREL Compliance Report are a true and accurate reflection based upon the design and construction information submitted for this dwelling for the purpose of carrying out the assessment, and that the supporting documentary evidence (identified in 11.1 and 11.2) pursuant to Part L of the Building Regulations 2010 (as amended) has been reviewed in the course of preparing this BREL Compliance Report.	
Signed: Name:	Assessor ID: Date:
b. Client Declaration	
This declaration by the client is confirmation that the dwelling has been constructed and completed according to the specifications set out in this BREL Compliance Report, and that photographic evidence of key stages, as described in 11.2, has been provided to the Assessor for this dwelling.	
Signed: Name:	Organisation: Date:

Full SAP Calculation Printout

Property Reference	78449-06	**Issued on Date**	03/10/2025
Assessment Reference	001	**Prop Type Ref**	Mid
Property	844 Rochdale Road, MANCHESTER, M9 8FA		

SAP Rating	84 B	**DER**	3.63	**TER**	11.59
Environmental	97 A	**% DER < TER**			68.68
CO_2 Emissions (t/year)	0.32	**DFEE**	34.22	**TFEE**	37.64
Compliance Check	See BREL	**% DFEE < TFEE**			9.08
% DPER < TPER	36.77	**DPER**	38.42	**TPER**	60.76

Assessor Details	Mr. Daniel Goddard	**Assessor ID**	CP52-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	41.1800 (1b)	x	2.4800 (2b)	=	102.1264	(1b) - (3b)
First floor	49.7800 (1c)	x	2.7800 (2c)	=	138.3884	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	90.9600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	240.5148	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.2500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2125	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2709	0.2656	0.2603	0.2338	0.2284	0.2019	0.2019	0.1966	0.2125	0.2284	0.2391	0.2497	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	81.0000 (23c)

Effective ac	0.3659	0.3606	0.3553	0.3287	0.3234	0.2969	0.2969	0.2916	0.3075	0.3234	0.3341	0.3447	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door			4.1400	1.0000	4.1400			(26)
Window			8.5100	0.7752	6.5969			(27)
GF			41.1800	0.0900	3.7062	75.0000	3088.5000	(28a)
Exposed Floor			8.6000	0.1400	1.2040	20.0000	172.0000	(28b)
Main	71.8472	12.6500	59.1972	0.1300	7.6956	9.0000	532.7748	(29a)
PIJ	49.7800		49.7800	0.1300	6.4714	9.0000	448.0200	(30)
Total net area of external elements Aum(A, m2)			171.4072					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.8141			(33)
Main dwelling								
Party Wall 1			81.2200	0.0000	0.0000	20.0000	1624.4000	(32)
Timber			96.4800			9.0000	868.3200	(32c)
FF			41.1800			18.0000	741.2400	(32d)
GF			41.1800			9.0000	370.6200	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 7845.8748 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 86.2563 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	8.6300	0.1150	0.9925
E3 Sill	8.6300	0.0170	0.1467
E4 Jamb	28.2000	0.0940	2.6508
E5 Ground floor (normal)	16.6400	0.0670	1.1149
E16 Corner (normal)	4.9600	0.0680	0.3373
E12 Gable (insulation at ceiling level)	11.0000	0.0770	0.8470
E6 Intermediate floor within a dwelling	11.0000	0.0320	0.3520
E17 Corner (inverted - internal area greater than external area)	4.9600	-0.0290	-0.1438
P1 Party wall - Ground floor	12.4600	0.3200	3.9872
E20 Exposed floor (normal)	6.4400	0.0790	0.5088
E21 Exposed floor (inverted)	12.0800	0.0630	0.7610
E18 Party wall between dwellings	11.1200	0.0920	1.0230
P4 Party wall - Roof (insulation at ceiling level)	18.1000	0.1020	1.8462
E25 Staggered party wall between dwellings	9.9200	0.0560	0.5555

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 14.9790 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 44.7932 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	29.0444	28.6228	28.2011	26.0928	25.6712	23.5629	23.5629	23.1413	24.4062	25.6712	26.5145	27.3578	(38)

Heat transfer coeff

	73.8376	73.4159	72.9943	70.8860	70.4644	68.3561	68.3561	67.9345	69.1994	70.4644	71.3077	72.1510	(39)

Average = Sum(39)m / 12 = 70.7806

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8118	0.8071	0.8025	0.7793	0.7747	0.7515	0.7515	0.7469	0.7608	0.7747	0.7839	0.7932	(40)
HLP (average)												0.7782	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6386 (42)
Hot water usage for mixer showers

68.4610	67.4321	65.9329	63.0644	60.9476	58.5869	57.2450	58.7329	60.3639	62.8986	65.8287	68.1987	(42a)

Hot water usage for baths

29.5637	29.1246	28.5063	27.3663	26.5127	25.5661	25.0549	25.6688	26.3373	27.3502	28.5137	29.4637	(42b)

Hot water usage for other uses

41.6522	40.1376	38.6230	37.1084	35.5937	34.0791	34.0791	35.5937	37.1084	38.6230	40.1376	41.6522	(42c)

Average daily hot water use (litres/day) 128.3946 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	139.6769	136.6944	133.0622	127.5391	123.0540	118.2321	116.3790	119.9955	123.8096	128.8717	134.4799	139.3147	(44)
Energy conte	221.2141	194.6510	204.5117	174.5947	165.6543	145.3802	140.7503	148.5795	152.6696	174.8777	191.5913	218.1331	(45)

Energy content (annual) Total = Sum(45)m = 2132.6075
Distribution loss (46)m = 0.15 x (45)m

33.1821	29.1976	30.6768	26.1892	24.8482	21.8070	21.1126	22.2869	22.9004	26.2317	28.7387	32.7200	(46)

Water storage loss:
Store volume 210.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.5800 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.8532 (55)
Total storage loss

26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(56)

If cylinder contains dedicated solar storage

26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

270.9257	239.5518	254.2233	222.7027	215.3659	193.4882	190.4619	198.2911	200.7776	224.5893	239.6993	267.8447	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

270.9257	239.5518	254.2233	222.7027	215.3659	193.4882	190.4619	198.2911	200.7776	224.5893	239.6993	267.8447	(64)

Total per year (kWh/year) = Sum(64)m = 2717.9215 (64)
12Total per year (kWh/year) 2718 (64)
Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)
Heat gains from water heating, kWh/month

113.3230	100.6421	107.7694	96.5391	94.8493	86.8253	86.5688	89.1720	89.2490	97.9161	102.1905	112.2985	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

145.9975	161.6401	145.9975	150.8641	145.9975	150.8641	145.9975	145.9975	150.8641	145.9975	150.8641	145.9975	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

240.8328	243.3319	237.0343	223.6274	206.7036	190.7976	180.1714	177.6723	183.9699	197.3768	214.3007	230.2066	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	(71)

Water heating gains (Table 5)

152.3158	149.7650	144.8514	134.0821	127.4857	120.5907	116.3559	119.8548	123.9570	131.6077	141.9313	150.9389	(72)

Total internal gains

601.7256	617.3165	590.4626	571.1531	542.7662	524.8319	505.1042	506.1041	521.3705	537.5615	569.6755	589.7225	(73)

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6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains

		m2	Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	factor Table 6d	W	
East		4.9800	19.6403	0.3000	0.0000	0.7700	22.5938	(76)
West		3.5300	19.6403	0.3000	0.0000	0.7700	16.0153	(80)

Solar gains	38.6090	75.5274	124.3829	181.4051	222.3188	227.5828	216.6681	186.1147	144.6625	89.6197	48.1409	31.7502	(83)
Total gains	640.3346	692.8439	714.8456	752.5582	765.0850	752.4147	721.7724	692.2188	666.0330	627.1812	617.8164	621.4727	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	29.5163	29.6858	29.8573	30.7453	30.9292	31.8832	31.8832	32.0811	31.4946	30.9292	30.5635	30.2062	
alpha	2.9678	2.9791	2.9905	3.0497	3.0619	3.1255	3.1255	3.1387	3.0996	3.0619	3.0376	3.0137	
util living area	0.9257	0.9043	0.8731	0.7999	0.6927	0.5314	0.4005	0.4303	0.6197	0.8090	0.8948	0.9301	(86)
Living	19.2059	19.4405	19.7783	20.2732	20.6431	20.8917	20.9664	20.9577	20.8146	20.3581	19.7568	19.2090	
Non living	18.5914	18.8234	19.1557	19.6451	19.9905	20.2218	20.2776	20.2761	20.1543	19.7347	19.1505	18.6062	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.0822	19.4405	19.7783	20.2732	20.6431	20.8917	20.9664	20.9577	20.8146	20.3581	19.7568	19.4595	(87)
Th 2	20.2432	20.2472	20.2512	20.2713	20.2753	20.2956	20.2956	20.2996	20.2875	20.2753	20.2673	20.2592	(88)
util rest of house	0.9178	0.8943	0.8594	0.7783	0.6591	0.4833	0.3413	0.3709	0.5731	0.7843	0.8824	0.9227	(89)
MIT 2	19.3982	18.8234	19.1557	19.6451	19.9905	20.2218	20.2776	20.2761	20.1543	19.7347	19.1505	18.8374	(90)
Living area fraction									fLA = Living area / (4) =			0.3196	(91)
MIT	19.6168	19.0206	19.3547	19.8458	20.1991	20.4359	20.4977	20.4939	20.3653	19.9339	19.3443	19.0362	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6168	19.0206	19.3547	19.8458	20.1991	20.4359	20.4977	20.4939	20.3653	19.9339	19.3443	19.0362	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9104	0.8750	0.8406	0.7644	0.6553	0.4932	0.3586	0.3877	0.5784	0.7714	0.8641	0.9082	(94)
Useful gains	582.9793	606.2386	600.8828	575.2925	501.3654	371.0947	258.8479	268.3853	385.2521	483.8220	533.8636	564.4085	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1130.9558	1036.6772	938.3184	775.9072	598.8824	398.9171	266.4323	278.1170	433.5571	657.7081	873.1091	1070.4479	(97)
Space heating kWh	407.6946	289.2547	251.0521	144.4425	72.5527	0.0000	0.0000	0.0000	0.0000	129.3713	244.2568	376.4933	(98a)
Space heating requirement - total per year (kWh/year)												1915.1180	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	407.6946	289.2547	251.0521	144.4425	72.5527	0.0000	0.0000	0.0000	0.0000	129.3713	244.2568	376.4933	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1915.1180	
Space heating per m2											(98c) / (4) =	21.0545	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Efficiency of main space heating system 1 (in %)	270.8847 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	407.6946	289.2547	251.0521	144.4425	72.5527	0.0000	0.0000	0.0000	0.0000	129.3713	244.2568	376.4933	(98)
Space heating efficiency (main heating system 1)	270.8847	270.8847	270.8847	270.8847	0.0000	0.0000	0.0000	0.0000	270.8847	270.8847	270.8847	270.8847	(210)
Space heating fuel (main heating system)	150.5048	106.7815	92.6786	53.3225	26.7836	0.0000	0.0000	0.0000	0.0000	47.7588	90.1700	138.9866	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	270.9257	239.5518	254.2233	222.7027	215.3659	193.4882	190.4619	198.2911	200.7776	224.5893	239.6993	267.8447	(64)
Efficiency of water heater												281.0493	(216)
(217)m	281.0493	281.0493	281.0493	281.0493	281.0493	281.0493	281.0493	281.0493	281.0493	281.0493	281.0493	281.0493	(217)
Fuel for water heating, kWh/month	96.3979	85.2348	90.4551	79.2397	76.6292	68.8449	67.7682	70.5539	71.4386	79.9110	85.2873	95.3017	(219)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	29.6563	26.7864	29.6563	28.6997	29.6563	28.6997	29.6563	29.6563	28.6997	29.6563	28.6997	29.6563	(231)
Lighting	30.8703	24.7653	22.2984	16.3368	12.6190	10.3098	11.5115	14.9631	19.4355	25.5005	28.8027	31.7283	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	706.9864	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	281.0493	
Water heating fuel used	967.0623	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.1900)		
mechanical ventilation fans (SFP = 1.1900)	349.1794	(230a)
Total electricity for the above, kWh/year	349.1794	(231)
Electricity for lighting (calculated in Appendix L)	249.1413	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2272.3695	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	706.9864	0.1552	109.7234	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	967.0623	0.1410	136.3181	(264)
Space and water heating			246.0414	(265)
Pumps, fans and electric keep-hot	349.1794	0.1387	48.4355	(267)
Energy for lighting	249.1413	0.1443	35.9588	(268)
Total CO2, kg/year			330.4357	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.6300	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	706.9864	1.5746	1113.1910	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	967.0623	1.5212	1471.1200	(278)
Space and water heating			2584.3110	(279)
Pumps, fans and electric keep-hot	349.1794	1.5128	528.2386	(281)
Energy for lighting	249.1413	1.5338	382.1413	(282)
Total Primary energy kWh/year			3494.6909	(286)
Dwelling Primary energy Rate (DPER)			38.4200	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	41.1800	(1b)	x 2.4800	(2b) =	102.1264	(1b) - (3b)
First floor	49.7800	(1c)	x 2.7800	(2c) =	138.3884	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	90.9600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		240.5148	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1247	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3747	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3185	(21)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4061	0.3982	0.3902	0.3504	0.3424	0.3026	0.3026	0.2946	0.3185	0.3424	0.3583	0.3743 (22b)
Effective ac	0.5825	0.5793	0.5761	0.5614	0.5586	0.5458	0.5458	0.5434	0.5507	0.5586	0.5642	0.5700 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			4.1400	1.0000	4.1400			(26)
TER Opening Type			8.5100	1.1450	9.7443			(27)
GF			41.1800	0.1300	5.3534			(28a)
Exposed Floor			8.6000	0.1300	1.1180			(28b)
Main	71.8472	12.6500	59.1972	0.1800	10.6555			(29a)
PIJ	49.7800		49.7800	0.1100	5.4758			(30)
Total net area of external elements Aum(A, m2)			171.4072					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	36.4870			(33)
Main dwelling								
Party Wall 1			81.2200	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 86.2563 (35)

List of Thermal Bridges

	Length	Psi-value	Total	
K1 Element				
E2 Other lintels (including other steel lintels)	8.6300	0.0500	0.4315	
E3 Sill	8.6300	0.0500	0.4315	
E4 Jamb	28.2000	0.0500	1.4100	
E5 Ground floor (normal)	16.6400	0.1600	2.6624	
E16 Corner (normal)	4.9600	0.0900	0.4464	
E12 Gable (insulation at ceiling level)	11.0000	0.0600	0.6600	
E6 Intermediate floor within a dwelling	11.0000	0.0000	0.0000	
E17 Corner (inverted - internal area greater than external area)	4.9600	-0.0900	-0.4464	
P1 Party wall - Ground floor	12.4600	0.0800	0.9968	
E20 Exposed floor (normal)	6.4400	0.3200	2.0608	
E21 Exposed floor (inverted)	12.0800	0.3200	3.8656	
E18 Party wall between dwellings	11.1200	0.0600	0.6672	
P4 Party wall - Roof (insulation at ceiling level)	18.1000	0.1200	2.1720	
E25 Staggered party wall between dwellings	9.9200	0.0600	0.5952	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 15.9530 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 52.4400 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	46.2302	45.9760	45.7269	44.5568	44.3378	43.3187	43.3187	43.1299	43.7112	44.3378	44.7807	45.2438	(38)
Heat transfer coeff	98.6702	98.4160	98.1669	96.9967	96.7778	95.7586	95.7586	95.5699	96.1512	96.7778	97.2207	97.6837	(39)
Average = Sum(39)m / 12 =												96.9957	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0848	1.0820	1.0792	1.0664	1.0640	1.0528	1.0528	1.0507	1.0571	1.0640	1.0688	1.0739	(40)
HLP (average)												1.0664	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6386 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	68.4610	67.4321	65.9329	63.0644	60.9476	58.5869	57.2450	58.7329	60.3639	62.8986	65.8287	68.1987	(42a)
Hot water usage for baths	29.5637	29.1246	28.5063	27.3663	26.5127	25.5661	25.0549	25.6688	26.3373	27.3502	28.5137	29.4637	(42b)
Hot water usage for other uses	41.6522	40.1376	38.6230	37.1084	35.5937	34.0791	34.0791	35.5937	37.1084	38.6230	40.1376	41.6522	(42c)
Average daily hot water use (litres/day)												128.3946	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	139.6769	136.6944	133.0622	127.5391	123.0540	118.2321	116.3790	119.9955	123.8096	128.8717	134.4799	139.3147	(44)
Energy conte	221.2141	194.6510	204.5117	174.5947	165.6543	145.3802	140.7503	148.5795	152.6696	174.8777	191.5913	218.1331	(45)
Energy content (annual)										Total = Sum(45)m =		2132.6075	
Distribution loss (46)m = 0.15 x (45)m	33.1821	29.1976	30.6768	26.1892	24.8482	21.8070	21.1126	22.2869	22.9004	26.2317	28.7387	32.7200	(46)
Water storage loss:													
Store volume												210.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7016	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.9188	(55)
Total storage loss	28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842	(56)
If cylinder contains dedicated solar storage	28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	272.9607	241.3898	256.2583	224.6720	217.4009	195.4575	192.4969	200.3261	202.7469	226.6243	241.6687	269.8797	(62)
WWHRS	-31.2975	-27.6798	-28.9847	-24.0004	-22.3675	-19.1401	-17.9408	-19.0782	-19.8031	-23.3456	-26.4477	-30.7179	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	241.6632	213.7101	227.2737	200.6716	195.0334	176.3175	174.5562	181.2479	182.9439	203.2787	215.2209	239.1618	(64)
										Total per year (kWh/year) = Sum(64)m =		2451.0786	(64)
12Total per year (kWh/year)												2451	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	114.9510	102.1125	109.3974	98.1146	96.4773	88.4008	88.1968	90.7999	90.8245	99.5441	103.7660	113.9265	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	142.2156	157.4530	142.2156	146.9561	142.2156	146.9561	142.2156	142.2156	146.9561	142.2156	146.9561	142.2156	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	240.8328	243.3319	237.0343	223.6274	206.7036	190.7976	180.1714	177.6723	183.9699	197.3768	214.3007	230.2066	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	(71)

Water heating gains (Table 5)

	154.5040	151.9532	147.0395	136.2703	129.6738	122.7789	118.5440	122.0429	126.1452	133.7959	144.1194	153.1270	(72)

Total internal gains

	603.1319	618.3176	591.8689	572.4333	544.1725	523.1121	503.5105	504.5103	519.6507	538.9678	570.9557	591.1288	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	4.9800	19.6403	0.6300	0.7000	0.7700	29.8916	(76)
West	3.5300	19.6403	0.6300	0.7000	0.7700	21.1882	(80)

Solar gains	51.0797	99.9228	164.5586	239.9990	294.1277	301.0921	286.6519	246.2298	191.3885	118.5668	63.6904	42.0055	(83)
Total gains	654.2116	718.2404	756.4276	812.4323	838.3003	824.2042	790.1625	750.7401	711.0392	657.5346	634.6461	633.1343	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	22.0878	22.1449	22.2011	22.4689	22.5197	22.7594	22.7594	22.8043	22.6665	22.5197	22.4171	22.3109	
alpha	2.4725	2.4763	2.4801	2.4979	2.5013	2.5173	2.5173	2.5203	2.5111	2.5013	2.4945	2.4874	
util living area	0.9360	0.9177	0.8901	0.8304	0.7393	0.6039	0.4758	0.5113	0.6900	0.8457	0.9133	0.9404	(86)
MIT	18.4055	18.6788	19.1165	19.7406	20.2920	20.7078	20.8849	20.8584	20.5623	19.8623	19.0543	18.3688	(87)
Th 2	20.0133	20.0156	20.0178	20.0284	20.0304	20.0396	20.0396	20.0413	20.0360	20.0304	20.0264	20.0222	(88)
util rest of house	0.9279	0.9074	0.8758	0.8069	0.7003	0.5405	0.3887	0.4252	0.6331	0.8197	0.9008	0.9329	(89)
MIT 2	16.9801	17.3251	17.8765	18.6558	19.3201	19.7941	19.9672	19.9474	19.6441	18.8191	17.8103	16.9389	(90)
Living area fraction									fLA = Living area / (4) =			0.3196	(91)
MIT	17.4357	17.7577	18.2728	19.0025	19.6307	20.0861	20.2605	20.2386	19.9375	19.1525	18.2078	17.3959	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.4357	17.7577	18.2728	19.0025	19.6307	20.0861	20.2605	20.2386	19.9375	19.1525	18.2078	17.3959	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8993	0.8764	0.8434	0.7775	0.6822	0.5438	0.4098	0.4440	0.6266	0.7911	0.8703	0.9053	(94)
Useful gains	588.3189	629.4443	637.9923	631.6314	571.9223	448.2148	323.7839	333.2941	445.5711	520.1449	552.3117	573.1478	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1296.0984	1265.4063	1155.6998	979.9051	767.5179	525.3461	350.5219	366.8520	561.2863	827.6930	1079.9121	1289.0229	(97)
Space heating kWh	526.5880	427.3664	385.1743	250.7571	145.5232	0.0000	0.0000	0.0000	0.0000	228.8158	379.8723	532.6111	(98a)
Space heating requirement - total per year (kWh/year)												2876.7082	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	526.5880	427.3664	385.1743	250.7571	145.5232	0.0000	0.0000	0.0000	228.8158	379.8723	532.6111	(98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												2876.7082	
Space heating per m2											(98c) / (4) =	31.6261	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	526.5880	427.3664	385.1743	250.7571	145.5232	0.0000	0.0000	0.0000	0.0000	228.8158	379.8723	532.6111	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	570.5179	463.0189	417.3070	271.6761	157.6632	0.0000	0.0000	0.0000	0.0000	247.9044	411.5627	577.0434	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	241.6632	213.7101	227.2737	200.6716	195.0334	176.3175	174.5562	181.2479	182.9439	203.2787	215.2209	239.1618	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.7576	85.5823	85.2328	84.5606	83.4125	79.8000	79.8000	79.8000	79.8000	84.3258	85.3199	85.8013	(217)
Fuel for water heating, kWh/month	281.7980	249.7128	266.6504	237.3110	233.8180	220.9492	218.7421	227.1276	229.2530	241.0634	252.2517	278.7391	(219)

Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	29.5496	23.7058	21.3444	15.6378	12.0791	9.8687	11.0190	14.3229	18.6040	24.4095	27.5704	30.3709	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-38.9812	-55.1702	-79.5760	-89.7571	-96.9883	-90.5718	-89.4598	-84.3870	-75.4216	-63.2498	-42.9366	-33.6769	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-21.3144	-44.9402	-89.5251	-134.7575	-178.4789	-179.4591	-177.3409	-150.0006	-109.7478	-64.3537	-28.4842	-16.8460	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	3116.6936	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2937.4164	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	238.4821	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-2035.4247	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	4343.1674	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3116.6936	0.2100	654.5057	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2937.4164	0.2100	616.8574	(264)
Space and water heating			1271.3631	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	238.4821	0.1443	34.4203	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-840.1762	0.1345	-113.0202	
PV Unit electricity exported	-1195.2485	0.1258	-150.3985	
Total			-263.4187	(269)
Total CO2, kg/year			1054.2940	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.5900	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	3116.6936	1.1300	3521.8638	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2937.4164	1.1300	3319.2805	(278)
Space and water heating			6841.1443	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	238.4821	1.5338	365.7919	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-840.1762	1.4972	-1257.8767	
PV Unit electricity exported	-1195.2485	0.4619	-552.0620	
Total			-1809.9387	(283)
Total Primary energy kWh/year			5527.0983	(286)
Target Primary Energy Rate (TPER)			60.7600	(287)

Full SAP Calculation Printout

Property Reference	78449-06	**Issued on Date**	03/10/2025
Assessment Reference	001	**Prop Type Ref**	Mid
Property	844 Rochdale Road, MANCHESTER, M9 8FA		

SAP Rating	84 B	**DER**	3.63	**TER**	11.59
Environmental	97 A	**% DER < TER**			68.68
CO_2 Emissions (t/year)	0.32	**DFEE**	34.22	**TFEE**	37.64
Compliance Check	See BREL	**% DFEE < TFEE**			9.08
% DPER < TPER	36.77	**DPER**	38.42	**TPER**	60.76

Assessor Details	Mr. Daniel Goddard	**Assessor ID**	CP52-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	41.1800 (1b)	x	2.4800 (2b)	=	102.1264	(1b) - (3b)
First floor	49.7800 (1c)	x	2.7800 (2c)	=	138.3884	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	90.9600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	240.5148	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1247	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3747	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3185	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4061	0.3982	0.3902	0.3504	0.3424	0.3026	0.3026	0.2946	0.3185	0.3424	0.3583	0.3743	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0.0000	(23c)

Effective ac	0.5825	0.5793	0.5761	0.5614	0.5586	0.5458	0.5458	0.5434	0.5507	0.5586	0.5642	0.5700	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door			4.1400	1.0000	4.1400			(26)
Window			8.5100	0.7752	6.5969			(27)
GF			41.1800	0.0900	3.7062	75.0000	3088.5000	(28a)
Exposed Floor			8.6000	0.1400	1.2040	20.0000	172.0000	(28b)
Main	71.8472	12.6500	59.1972	0.1300	7.6956	9.0000	532.7748	(29a)
PIJ	49.7800		49.7800	0.1300	6.4714	9.0000	448.0200	(30)
Total net area of external elements Aum(A, m2)			171.4072					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	29.8141			(33)
Main dwelling								
Party Wall 1			81.2200	0.0000	0.0000	20.0000	1624.4000	(32)
Timber			96.4800			9.0000	868.3200	(32c)
FF			41.1800			18.0000	741.2400	(32d)
GF			41.1800			9.0000	370.6200	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	7845.8748 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		86.2563 (35)
List of Thermal Bridges		

	Length	Psi-value	Total	
K1 Element				
E2 Other lintels (including other steel lintels)	8.6300	0.1150	0.9925	
E3 Sill	8.6300	0.0170	0.1467	
E4 Jamb	28.2000	0.0940	2.6508	
E5 Ground floor (normal)	16.6400	0.0670	1.1149	
E16 Corner (normal)	4.9600	0.0680	0.3373	
E12 Gable (insulation at ceiling level)	11.0000	0.0770	0.8470	
E6 Intermediate floor within a dwelling	11.0000	0.0320	0.3520	
E17 Corner (inverted - internal area greater than external area)	4.9600	-0.0290	-0.1438	
P1 Party wall - Ground floor	12.4600	0.3200	3.9872	
E20 Exposed floor (normal)	6.4400	0.0790	0.5088	
E21 Exposed floor (inverted)	12.0800	0.0630	0.7610	
E18 Party wall between dwellings	11.1200	0.0920	1.0230	
P4 Party wall - Roof (insulation at ceiling level)	18.1000	0.1020	1.8462	
E25 Staggered party wall between dwellings	9.9200	0.0560	0.5555	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			14.9790	(36)
Point Thermal bridges		(36a) =	0.0000	
Total fabric heat loss		(33) + (36) + (36a) =	44.7932	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	46.2302	45.9760	45.7269	44.5568	44.3378	43.3187	43.3187	43.1299	43.7112	44.3378	44.7807	45.2438	(38)
Heat transfer coeff	91.0234	90.7692	90.5201	89.3499	89.1310	88.1119	88.1119	87.9231	88.5044	89.1310	89.5739	90.0369	(39)
Average = Sum(39)m / 12 =												89.3489	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0007	0.9979	0.9952	0.9823	0.9799	0.9687	0.9687	0.9666	0.9730	0.9799	0.9848	0.9899	(40)
HLP (average)												0.9823	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Assumed occupancy												2.6386	(42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	29.5637	29.1246	28.5063	27.3663	26.5127	25.5661	25.0549	25.6688	26.3373	27.3502	28.5137	29.4637	(42b)
Hot water usage for other uses	41.6522	40.1376	38.6230	37.1084	35.5937	34.0791	34.0791	35.5937	37.1084	38.6230	40.1376	41.6522	(42c)
Average daily hot water use (litres/day)												65.2759	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	71.2159	69.2622	67.1293	64.4747	62.1064	59.6452	59.1340	61.2626	63.4457	65.9732	68.6513	71.1160	(44)
Energy conte	112.7886	98.6285	103.1753	88.2626	83.6072	73.3408	71.5174	75.8559	78.2349	89.5249	97.8063	111.3504	(45)
Energy content (annual)										Total = Sum(45)m =		1084.0928	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	95.8703	83.8342	87.6990	75.0232	71.0661	62.3397	60.7898	64.4775	66.4996	76.0962	83.1354	94.6479	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	95.8703	83.8342	87.6990	75.0232	71.0661	62.3397	60.7898	64.4775	66.4996	76.0962	83.1354	94.6479	(64)
										Total per year (kWh/year) = Sum(64)m =		921.4789	(64)
12Total per year (kWh/year)												921	(64)
Electric shower(s)	54.8258	48.8503	53.3426	50.9042	51.8594	49.4688	51.1178	51.8594	50.9042	53.3426	52.3396	54.8258	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		623.6406	(64a)
Heat gains from water heating, kWh/month	37.6740	33.1711	35.2604	31.4819	30.7314	27.9521	27.9769	29.0842	29.3510	32.3597	33.8687	37.3684	(65)

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5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	145.9975	161.6401	145.9975	150.8641	145.9975	150.8641	145.9975	145.9975	150.8641	145.9975	150.8641	145.9975	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	240.8328	243.3319	237.0343	223.6274	206.7036	190.7976	180.1714	177.6723	183.9699	197.3768	214.3007	230.2066	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	(71)
Water heating gains (Table 5)	50.6372	49.3618	47.3930	43.7248	41.3056	38.8224	37.6034	39.0917	40.7652	43.4942	47.0399	50.2264	(72)
Total internal gains	500.0470	516.9133	493.0043	480.7957	456.5862	443.0635	426.3517	425.3410	438.1787	449.4480	474.7841	489.0100	(73)

---

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	4.9800	19.6403	0.3000	0.0000	0.7700	22.5938	(76)
West	3.5300	19.6403	0.3000	0.0000	0.7700	16.0153	(80)

Solar gains	38.6090	75.5274	124.3829	181.4051	222.3188	227.5828	216.6681	186.1147	144.6625	89.6197	48.1409	31.7502	(83)
Total gains	538.6560	592.4407	617.3872	662.2009	678.9049	670.6464	643.0199	611.4557	582.8412	539.0677	522.9250	520.7602	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	23.9434	24.0105	24.0765	24.3918	24.4518	24.7346	24.7346	24.7877	24.6249	24.4518	24.3309	24.2057	
alpha	2.5962	2.6007	2.6051	2.6261	2.6301	2.6490	2.6490	2.6525	2.6417	2.6301	2.6221	2.6137	
util living area	0.9553	0.9409	0.9205	0.8713	0.7924	0.6605	0.5285	0.5654	0.7421	0.8831	0.9377	0.9587	(86)
MIT	18.3957	18.6561	19.0682	19.6845	20.2400	20.6826	20.8745	20.8458	20.5334	19.8223	19.0327	18.3640	(87)
Th 2	20.0828	20.0851	20.0874	20.0981	20.1001	20.1095	20.1095	20.1112	20.1059	20.1001	20.0961	20.0918	(88)
util rest of house	0.9496	0.9334	0.9098	0.8526	0.7590	0.6012	0.4423	0.4813	0.6912	0.8625	0.9285	0.9535	(89)
MIT 2	17.6867	17.9450	18.3528	18.9606	19.4904	19.8937	20.0444	20.0272	19.7689	19.1029	18.3273	17.6614	(90)
Living area fraction										fLA = Living area / (4) =		0.3196	(91)
MIT	17.9133	18.1723	18.5814	19.1920	19.7300	20.1459	20.3097	20.2888	20.0132	19.3328	18.5527	17.8859	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.9133	18.1723	18.5814	19.1920	19.7300	20.1459	20.3097	20.2888	20.0132	19.3328	18.5527	17.8859	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9316	0.9130	0.8875	0.8302	0.7434	0.6038	0.4629	0.4993	0.6853	0.8411	0.9082	0.9364	(94)
Useful gains	501.7981	540.8973	547.9198	549.7682	504.6789	404.9694	297.6235	305.2822	399.4211	453.4351	474.9412	487.6325	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1239.1269	1204.7135	1093.6108	919.5872	715.7213	488.6558	326.8695	341.9194	523.3451	778.3676	1025.8637	1232.2388	(97)
Space heating kWh	548.5726	446.0845	405.9941	266.2697	157.0156	0.0000	0.0000	0.0000	0.0000	241.7498	396.6642	553.9871	(98a)
Space heating requirement - total per year (kWh/year)												3016.3375	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	548.5726	446.0845	405.9941	266.2697	157.0156	0.0000	0.0000	0.0000	0.0000	241.7498	396.6642	553.9871	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3016.3375	
Space heating per m2											(98c) / (4) =	33.1611	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	828.2514	652.0277	668.2157	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.6672	0.7409	0.7138	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	552.6268	483.0982	476.9890	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	708.6181	679.8104	645.9957	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	112.3137	146.3539	125.7410	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	28.0784	36.5885	31.4352	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												96.1022	(107)
Energy for space heating												33.1611	(99)
Energy for space cooling												1.0565	(108)
Total												34.2177	(109)
Fabric Energy Efficiency (DFEE)												34.2	(109)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	41.1800	(1b)	x 2.4800	(2b) =	102.1264	(1b) - (3b)
First floor	49.7800	(1c)	x 2.7800	(2c) =	138.3884	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	90.9600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		240.5148	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)

Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1247	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3747	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3185	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													
	0.4061	0.3982	0.3902	0.3504	0.3424	0.3026	0.3026	0.2946	0.3185	0.3424	0.3583	0.3743	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0.0000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5825	0.5793	0.5761	0.5614	0.5586	0.5458	0.5458	0.5434	0.5507	0.5586	0.5642	0.5700	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			4.1400	1.0000	4.1400			(26)
TER Opening Type			8.5100	1.1450	9.7443			(27)
GF			41.1800	0.1300	5.3534			(28a)
Exposed Floor			8.6000	0.1300	1.1180			(28b)
Main	71.8472	12.6500	59.1972	0.1800	10.6555			(29a)
PIJ	49.7800		49.7800	0.1100	5.4758			(30)
Total net area of external elements Aum(A, m2)			171.4072					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	36.4870			(33)
Main dwelling								
Party Wall 1			81.2200	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 86.2563 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	8.6300	0.0500	0.4315
E3 Sill	8.6300	0.0500	0.4315
E4 Jamb	28.2000	0.0500	1.4100
E5 Ground floor (normal)	16.6400	0.1600	2.6624
E16 Corner (normal)	4.9600	0.0900	0.4464
E12 Gable (insulation at ceiling level)	11.0000	0.0600	0.6600
E6 Intermediate floor within a dwelling	11.0000	0.0000	0.0000
E17 Corner (inverted - internal area greater than external area)	4.9600	-0.0900	-0.4464
P1 Party wall - Ground floor	12.4600	0.0800	0.9968
E20 Exposed floor (normal)	6.4400	0.3200	2.0608
E21 Exposed floor (inverted)	12.0800	0.3200	3.8656
E18 Party wall between dwellings	11.1200	0.0600	0.6672
P4 Party wall - Roof (insulation at ceiling level)	18.1000	0.1200	2.1720
E25 Staggered party wall between dwellings	9.9200	0.0600	0.5952

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		15.9530 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	52.4400 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	46.2302	45.9760	45.7269	44.5568	44.3378	43.3187	43.3187	43.1299	43.7112	44.3378	44.7807	45.2438	(38)
Heat transfer coeff													
	98.6702	98.4160	98.1669	96.9967	96.7778	95.7586	95.7586	95.5699	96.1512	96.7778	97.2207	97.6837	(39)
Average = Sum(39)m / 12 =												96.9957	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0848	1.0820	1.0792	1.0664	1.0640	1.0528	1.0528	1.0507	1.0571	1.0640	1.0688	1.0739	(40)
HLP (average)												1.0664	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.6386 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

29.5637	29.1246	28.5063	27.3663	26.5127	25.5661	25.0549	25.6688	26.3373	27.3502	28.5137	29.4637	(42b)

Hot water usage for other uses

41.6522	40.1376	38.6230	37.1084	35.5937	34.0791	34.0791	35.5937	37.1084	38.6230	40.1376	41.6522	(42c)

Average daily hot water use (litres/day)	65.2759 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	71.2159	69.2622	67.1293	64.4747	62.1064	59.6452	59.1340	61.2626	63.4457	65.9732	68.6513	71.1160	(44)
Energy conte	112.7886	98.6285	103.1753	88.2626	83.6072	73.3408	71.5174	75.8559	78.2349	89.5249	97.8063	111.3504	(45)
Energy content (annual)										Total = Sum(45)m =		1084.0928	
Distribution loss (46)m = 0.15 x (45)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	95.8703	83.8342	87.6990	75.0232	71.0661	62.3397	60.7898	64.4775	66.4996	76.0962	83.1354	94.6479	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)

FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	95.8703	83.8342	87.6990	75.0232	71.0661	62.3397	60.7898	64.4775	66.4996	76.0962	83.1354	94.6479	(64)
										Total per year (kWh/year) = Sum(64)m =		921.4789	(64)
12Total per year (kWh/year)												921	(64)
Electric shower(s)	54.8258	48.8503	53.3426	50.9042	51.8594	49.4688	51.1178	51.8594	50.9042	53.3426	52.3396	54.8258	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		623.6406	(64a)
Heat gains from water heating, kWh/month	37.6740	33.1711	35.2604	31.4819	30.7314	27.9521	27.9769	29.0842	29.3510	32.3597	33.8687	37.3684	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	142.2156	157.4530	142.2156	146.9561	142.2156	146.9561	142.2156	142.2156	146.9561	142.2156	146.9561	142.2156	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	240.8328	243.3319	237.0343	223.6274	206.7036	190.7976	180.1714	177.6723	183.9699	197.3768	214.3007	230.2066	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	(71)
Water heating gains (Table 5)	50.6372	49.3618	47.3930	43.7248	41.3056	38.8224	37.6034	39.0917	40.7652	43.4942	47.0399	50.2264	(72)
Total internal gains	496.2651	512.7262	489.2224	476.8878	452.8043	439.1556	422.5699	421.5591	434.2708	445.6662	470.8762	485.2281	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	4.9800	19.6403	0.6300	0.7000	0.7700	29.8916	(76)
West	3.5300	19.6403	0.6300	0.7000	0.7700	21.1882	(80)

Solar gains	51.0797	99.9228	164.5586	239.9990	294.1277	301.0921	286.6519	246.2298	191.3885	118.5668	63.6904	42.0055	(83)
Total gains	547.3448	612.6490	653.7810	716.8868	746.9320	740.2477	709.2218	667.7889	625.6593	564.2330	534.5666	527.2336	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	22.0878	22.1449	22.2011	22.4689	22.5197	22.7594	22.7594	22.8043	22.6665	22.5197	22.4171	22.3109	
alpha	2.4725	2.4763	2.4801	2.4979	2.5013	2.5173	2.5173	2.5203	2.5111	2.5013	2.4945	2.4874	
util living area	0.9553	0.9395	0.9159	0.8618	0.7774	0.6454	0.5167	0.5565	0.7358	0.8810	0.9378	0.9589	(86)
MIT	18.1813	18.4692	18.9293	19.5971	20.1934	20.6573	20.8607	20.8274	20.4857	19.7132	18.8568	18.1428	(87)
Th 2	20.0133	20.0156	20.0178	20.0284	20.0304	20.0396	20.0396	20.0413	20.0360	20.0304	20.0264	20.0222	(88)
util rest of house	0.9493	0.9315	0.9042	0.8412	0.7411	0.5823	0.4257	0.4674	0.6816	0.8592	0.9282	0.9535	(89)
MIT 2	17.4304	17.7155	18.1700	18.8263	19.3922	19.8117	19.9700	19.9503	19.6706	18.9496	18.1090	17.3981	(90)
Living area fraction										fLA = Living area / (4) =		0.3196	(91)
MIT	17.6704	17.9564	18.4127	19.0726	19.6482	20.0820	20.2547	20.2306	19.9311	19.1936	18.3480	17.6361	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.6704	17.9564	18.4127	19.0726	19.6482	20.0820	20.2547	20.2306	19.9311	19.1936	18.3480	17.6361	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9303	0.9095	0.8799	0.8170	0.7248	0.5854	0.4474	0.4863	0.6750	0.8360	0.9066	0.9354	(94)
Useful gains	509.1687	557.2223	575.2474	585.7154	541.3866	433.3140	317.2871	324.7498	422.3123	471.6937	484.6376	493.1838	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1319.2565	1284.9585	1169.4306	986.7115	769.2141	524.9448	349.9653	366.0891	560.6671	831.6736	1093.5350	1312.4905	(97)
Space heating kWh	602.7053	489.0387	442.0723	288.7172	169.5036	0.0000	0.0000	0.0000	0.0000	267.8250	438.4062	609.5642	(98a)
Space heating requirement - total per year (kWh/year)												3307.8326	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	602.7053	489.0387	442.0723	288.7172	169.5036	0.0000	0.0000	0.0000	0.0000	267.8250	438.4062	609.5642	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3307.8326	
Space heating per m2											(98c) / (4) =	36.3658	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	900.1313	708.6140	726.3314	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.6696	0.7408	0.7107	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	602.7506	524.9696	516.1911	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	794.2071	761.2522	715.7953	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	137.8487	175.7942	148.5055	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)

Intermittency factor (Table 10b)

0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)

Space cooling kWh

0.0000	0.0000	0.0000	0.0000	0.0000	34.4622	43.9486	37.1264	0.0000	0.0000	0.0000	0.0000	(107)

Space cooling requirement	115.5371	(107)
Energy for space heating	36.3658	(99)
Energy for space cooling	1.2702	(108)
Total	37.6360	(109)
Fabric Energy Efficiency (TFEE)	37.6	(109)

Full SAP Calculation Printout

Property Reference	78449-06	**Issued on Date**	03/10/2025
Assessment Reference	001	**Prop Type Ref**	Mid
Property	844 Rochdale Road, MANCHESTER, M9 8FA		

SAP Rating	84 B	**DER**	3.63	**TER**	11.59
Environmental	97 A	**% DER < TER**			68.68
CO_2 Emissions (t/year)	0.32	**DFEE**	34.22	**TFEE**	37.64
Compliance Check	See BREL	**% DFEE < TFEE**			9.08
% DPER < TPER	36.77	**DPER**	38.42	**TPER**	60.76

Assessor Details	Mr. Daniel Goddard	**Assessor ID**	CP52-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	41.1800 (1b)	x	2.4800 (2b)	=	102.1264	(1b) - (3b)
First floor	49.7800 (1c)	x	2.7800 (2c)	=	138.3884	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	90.9600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	240.5148	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.2500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2125	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2709	0.2656	0.2603	0.2338	0.2284	0.2019	0.2019	0.1966	0.2125	0.2284	0.2391	0.2497	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	81.0000 (23c)

Effective ac	0.3659	0.3606	0.3553	0.3287	0.3234	0.2969	0.2969	0.2916	0.3075	0.3234	0.3341	0.3447	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door			4.1400	1.0000	4.1400			(26)
Window			8.5100	0.7752	6.5969			(27)
GF			41.1800	0.0900	3.7062	75.0000	3088.5000	(28a)
Exposed Floor			8.6000	0.1400	1.2040	20.0000	172.0000	(28b)
Main	71.8472	12.6500	59.1972	0.1300	7.6956	9.0000	532.7748	(29a)
PIJ	49.7800		49.7800	0.1300	6.4714	9.0000	448.0200	(30)
Total net area of external elements Aum(A, m2)			171.4072					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.8141			(33)
Main dwelling								
Party Wall 1			81.2200	0.0000	0.0000	20.0000	1624.4000	(32)
Timber			96.4800			9.0000	868.3200	(32c)
FF			41.1800			18.0000	741.2400	(32d)
GF			41.1800			9.0000	370.6200	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 7845.8748 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 86.2563 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	8.6300	0.1150	0.9925
E3 Sill	8.6300	0.0170	0.1467
E4 Jamb	28.2000	0.0940	2.6508
E5 Ground floor (normal)	16.6400	0.0670	1.1149
E16 Corner (normal)	4.9600	0.0680	0.3373
E12 Gable (insulation at ceiling level)	11.0000	0.0770	0.8470
E6 Intermediate floor within a dwelling	11.0000	0.0320	0.3520
E17 Corner (inverted - internal area greater than external area)	4.9600	-0.0290	-0.1438
P1 Party wall - Ground floor	12.4600	0.3200	3.9872
E20 Exposed floor (normal)	6.4400	0.0790	0.5088
E21 Exposed floor (inverted)	12.0800	0.0630	0.7610
E18 Party wall between dwellings	11.1200	0.0920	1.0230
P4 Party wall - Roof (insulation at ceiling level)	18.1000	0.1020	1.8462
E25 Staggered party wall between dwellings	9.9200	0.0560	0.5555

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 14.9790 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 44.7932 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	29.0444	28.6228	28.2011	26.0928	25.6712	23.5629	23.5629	23.1413	24.4062	25.6712	26.5145	27.3578	(38)

Heat transfer coeff

	73.8376	73.4159	72.9943	70.8860	70.4644	68.3561	68.3561	67.9345	69.1994	70.4644	71.3077	72.1510	(39)

Average = Sum(39)m / 12 = 70.7806

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8118	0.8071	0.8025	0.7793	0.7747	0.7515	0.7515	0.7469	0.7608	0.7747	0.7839	0.7932	(40)
HLP (average)												0.7782	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6386 (42)
Hot water usage for mixer showers

68.4610	67.4321	65.9329	63.0644	60.9476	58.5869	57.2450	58.7329	60.3639	62.8986	65.8287	68.1987	(42a)

Hot water usage for baths

29.5637	29.1246	28.5063	27.3663	26.5127	25.5661	25.0549	25.6688	26.3373	27.3502	28.5137	29.4637	(42b)

Hot water usage for other uses

41.6522	40.1376	38.6230	37.1084	35.5937	34.0791	34.0791	35.5937	37.1084	38.6230	40.1376	41.6522	(42c)

Average daily hot water use (litres/day) 128.3946 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	139.6769	136.6944	133.0622	127.5391	123.0540	118.2321	116.3790	119.9955	123.8096	128.8717	134.4799	139.3147	(44)
Energy conte	221.2141	194.6510	204.5117	174.5947	165.6543	145.3802	140.7503	148.5795	152.6696	174.8777	191.5913	218.1331	(45)

Energy content (annual) Total = Sum(45)m = 2132.6075
Distribution loss (46)m = 0.15 x (45)m

33.1821	29.1976	30.6768	26.1892	24.8482	21.8070	21.1126	22.2869	22.9004	26.2317	28.7387	32.7200	(46)

Water storage loss:
Store volume 210.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.5800 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.8532 (55)
Total storage loss

26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(56)

If cylinder contains dedicated solar storage

26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

270.9257	239.5518	254.2233	222.7027	215.3659	193.4882	190.4619	198.2911	200.7776	224.5893	239.6993	267.8447	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

270.9257	239.5518	254.2233	222.7027	215.3659	193.4882	190.4619	198.2911	200.7776	224.5893	239.6993	267.8447	(64)

Total per year (kWh/year) = Sum(64)m = 2717.9215 (64)
12Total per year (kWh/year) 2718 (64)
Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)
Heat gains from water heating, kWh/month

113.3230	100.6421	107.7694	96.5391	94.8493	86.8253	86.5688	89.1720	89.2490	97.9161	102.1905	112.2985	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

145.9975	161.6401	145.9975	150.8641	145.9975	150.8641	145.9975	145.9975	150.8641	145.9975	150.8641	145.9975	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

240.8328	243.3319	237.0343	223.6274	206.7036	190.7976	180.1714	177.6723	183.9699	197.3768	214.3007	230.2066	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	(71)

Water heating gains (Table 5)

152.3158	149.7650	144.8514	134.0821	127.4857	120.5907	116.3559	119.8548	123.9570	131.6077	141.9313	150.9389	(72)

Total internal gains

601.7256	617.3165	590.4626	571.1531	542.7662	524.8319	505.1042	506.1041	521.3705	537.5615	569.6755	589.7225	(73)

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6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains

		m2	Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	factor Table 6d	W	
East		4.9800	19.6403	0.3000	0.0000	0.7700	22.5938	(76)
West		3.5300	19.6403	0.3000	0.0000	0.7700	16.0153	(80)

Solar gains	38.6090	75.5274	124.3829	181.4051	222.3188	227.5828	216.6681	186.1147	144.6625	89.6197	48.1409	31.7502	(83)
Total gains	640.3346	692.8439	714.8456	752.5582	765.0850	752.4147	721.7724	692.2188	666.0330	627.1812	617.8164	621.4727	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	29.5163	29.6858	29.8573	30.7453	30.9292	31.8832	31.8832	32.0811	31.4946	30.9292	30.5635	30.2062	
alpha	2.9678	2.9791	2.9905	3.0497	3.0619	3.1255	3.1255	3.1387	3.0996	3.0619	3.0376	3.0137	
util living area	0.9257	0.9043	0.8731	0.7999	0.6927	0.5314	0.4005	0.4303	0.6197	0.8090	0.8948	0.9301	(86)
Living	19.2059	19.4405	19.7783	20.2732	20.6431	20.8917	20.9664	20.9577	20.8146	20.3581	19.7568	19.2090	
Non living	18.5914	18.8234	19.1557	19.6451	19.9905	20.2218	20.2776	20.2761	20.1543	19.7347	19.1505	18.6062	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.0822	19.4405	19.7783	20.2732	20.6431	20.8917	20.9664	20.9577	20.8146	20.3581	19.7568	19.4595	(87)
Th 2	20.2432	20.2472	20.2512	20.2713	20.2753	20.2956	20.2956	20.2996	20.2875	20.2753	20.2673	20.2592	(88)
util rest of house	0.9178	0.8943	0.8594	0.7783	0.6591	0.4833	0.3413	0.3709	0.5731	0.7843	0.8824	0.9227	(89)
MIT 2	19.3982	18.8234	19.1557	19.6451	19.9905	20.2218	20.2776	20.2761	20.1543	19.7347	19.1505	18.8374	(90)
Living area fraction									fLA = Living area / (4) =			0.3196	(91)
MIT	19.6168	19.0206	19.3547	19.8458	20.1991	20.4359	20.4977	20.4939	20.3653	19.9339	19.3443	19.0362	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6168	19.0206	19.3547	19.8458	20.1991	20.4359	20.4977	20.4939	20.3653	19.9339	19.3443	19.0362	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9104	0.8750	0.8406	0.7644	0.6553	0.4932	0.3586	0.3877	0.5784	0.7714	0.8641	0.9082	(94)
Useful gains	582.9793	606.2386	600.8828	575.2925	501.3654	371.0947	258.8479	268.3853	385.2521	483.8220	533.8636	564.4085	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1130.9558	1036.6772	938.3184	775.9072	598.8824	398.9171	266.4323	278.1170	433.5571	657.7081	873.1091	1070.4479	(97)
Space heating kWh	407.6946	289.2547	251.0521	144.4425	72.5527	0.0000	0.0000	0.0000	0.0000	129.3713	244.2568	376.4933	(98a)
Space heating requirement - total per year (kWh/year)												1915.1180	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	407.6946	289.2547	251.0521	144.4425	72.5527	0.0000	0.0000	0.0000	0.0000	129.3713	244.2568	376.4933	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1915.1180	
Space heating per m2											(98c) / (4) =	21.0545	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Efficiency of main space heating system 1 (in %)	270.8847 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	407.6946	289.2547	251.0521	144.4425	72.5527	0.0000	0.0000	0.0000	0.0000	129.3713	244.2568	376.4933	(98)
Space heating efficiency (main heating system 1)	270.8847	270.8847	270.8847	270.8847	0.0000	0.0000	0.0000	0.0000	270.8847	270.8847	270.8847	270.8847	(210)
Space heating fuel (main heating system)	150.5048	106.7815	92.6786	53.3225	26.7836	0.0000	0.0000	0.0000	0.0000	47.7588	90.1700	138.9866	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	270.9257	239.5518	254.2233	222.7027	215.3659	193.4882	190.4619	198.2911	200.7776	224.5893	239.6993	267.8447	(64)
Efficiency of water heater												281.0493	(216)
(217)m	281.0493	281.0493	281.0493	281.0493	281.0493	281.0493	281.0493	281.0493	281.0493	281.0493	281.0493	281.0493	(217)
Fuel for water heating, kWh/month	96.3979	85.2348	90.4551	79.2397	76.6292	68.8449	67.7682	70.5539	71.4386	79.9110	85.2873	95.3017	(219)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	29.6563	26.7864	29.6563	28.6997	29.6563	28.6997	29.6563	29.6563	28.6997	29.6563	28.6997	29.6563	(231)
Lighting	30.8703	24.7653	22.2984	16.3368	12.6190	10.3098	11.5115	14.9631	19.4355	25.5005	28.8027	31.7283	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	706.9864	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	281.0493	
Water heating fuel used	967.0623	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.1900)		
mechanical ventilation fans (SFP = 1.1900)	349.1794	(230a)
Total electricity for the above, kWh/year	349.1794	(231)
Electricity for lighting (calculated in Appendix L)	249.1413	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2272.3695	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	706.9864	0.1552	109.7234	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	967.0623	0.1410	136.3181	(264)
Space and water heating			246.0414	(265)
Pumps, fans and electric keep-hot	349.1794	0.1387	48.4355	(267)
Energy for lighting	249.1413	0.1443	35.9588	(268)
Total CO2, kg/year			330.4357	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.6300	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	706.9864	1.5746	1113.1910	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	967.0623	1.5212	1471.1200	(278)
Space and water heating			2584.3110	(279)
Pumps, fans and electric keep-hot	349.1794	1.5128	528.2386	(281)
Energy for lighting	249.1413	1.5338	382.1413	(282)
Total Primary energy kWh/year			3494.6909	(286)
Dwelling Primary energy Rate (DPER)			38.4200	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	41.1800	(1b)	x 2.4800	(2b) =	102.1264	(1b) - (3b)
First floor	49.7800	(1c)	x 2.7800	(2c) =	138.3884	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	90.9600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		240.5148	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1247	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3747	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3185	(21)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4061	0.3982	0.3902	0.3504	0.3424	0.3026	0.3026	0.2946	0.3185	0.3424	0.3583	0.3743 (22b)
Effective ac	0.5825	0.5793	0.5761	0.5614	0.5586	0.5458	0.5458	0.5434	0.5507	0.5586	0.5642	0.5700 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			4.1400	1.0000	4.1400			(26)
TER Opening Type			8.5100	1.1450	9.7443			(27)
GF			41.1800	0.1300	5.3534			(28a)
Exposed Floor			8.6000	0.1300	1.1180			(28b)
Main	71.8472	12.6500	59.1972	0.1800	10.6555			(29a)
PIJ	49.7800		49.7800	0.1100	5.4758			(30)
Total net area of external elements Aum(A, m2)			171.4072					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	36.4870			(33)
Main dwelling								
Party Wall 1			81.2200	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 86.2563 (35)

List of Thermal Bridges

	Length	Psi-value	Total	
K1 Element				
E2 Other lintels (including other steel lintels)	8.6300	0.0500	0.4315	
E3 Sill	8.6300	0.0500	0.4315	
E4 Jamb	28.2000	0.0500	1.4100	
E5 Ground floor (normal)	16.6400	0.1600	2.6624	
E16 Corner (normal)	4.9600	0.0900	0.4464	
E12 Gable (insulation at ceiling level)	11.0000	0.0600	0.6600	
E6 Intermediate floor within a dwelling	11.0000	0.0000	0.0000	
E17 Corner (inverted - internal area greater than external area)	4.9600	-0.0900	-0.4464	
P1 Party wall - Ground floor	12.4600	0.0800	0.9968	
E20 Exposed floor (normal)	6.4400	0.3200	2.0608	
E21 Exposed floor (inverted)	12.0800	0.3200	3.8656	
E18 Party wall between dwellings	11.1200	0.0600	0.6672	
P4 Party wall - Roof (insulation at ceiling level)	18.1000	0.1200	2.1720	
E25 Staggered party wall between dwellings	9.9200	0.0600	0.5952	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 15.9530 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 52.4400 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	46.2302	45.9760	45.7269	44.5568	44.3378	43.3187	43.3187	43.1299	43.7112	44.3378	44.7807	45.2438	(38)
Heat transfer coeff	98.6702	98.4160	98.1669	96.9967	96.7778	95.7586	95.7586	95.5699	96.1512	96.7778	97.2207	97.6837	(39)
Average = Sum(39)m / 12 =												96.9957	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0848	1.0820	1.0792	1.0664	1.0640	1.0528	1.0528	1.0507	1.0571	1.0640	1.0688	1.0739	(40)
HLP (average)												1.0664	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6386 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	68.4610	67.4321	65.9329	63.0644	60.9476	58.5869	57.2450	58.7329	60.3639	62.8986	65.8287	68.1987	(42a)
Hot water usage for baths	29.5637	29.1246	28.5063	27.3663	26.5127	25.5661	25.0549	25.6688	26.3373	27.3502	28.5137	29.4637	(42b)
Hot water usage for other uses	41.6522	40.1376	38.6230	37.1084	35.5937	34.0791	34.0791	35.5937	37.1084	38.6230	40.1376	41.6522	(42c)
Average daily hot water use (litres/day)												128.3946	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	139.6769	136.6944	133.0622	127.5391	123.0540	118.2321	116.3790	119.9955	123.8096	128.8717	134.4799	139.3147	(44)
Energy conte	221.2141	194.6510	204.5117	174.5947	165.6543	145.3802	140.7503	148.5795	152.6696	174.8777	191.5913	218.1331	(45)
Energy content (annual)										Total = Sum(45)m =		2132.6075	
Distribution loss (46)m = 0.15 x (45)m	33.1821	29.1976	30.6768	26.1892	24.8482	21.8070	21.1126	22.2869	22.9004	26.2317	28.7387	32.7200	(46)
Water storage loss:													
Store volume												210.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7016	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.9188	(55)
Total storage loss	28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842	(56)
If cylinder contains dedicated solar storage	28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	272.9607	241.3898	256.2583	224.6720	217.4009	195.4575	192.4969	200.3261	202.7469	226.6243	241.6687	269.8797	(62)
WWHRS	-31.2975	-27.6798	-28.9847	-24.0004	-22.3675	-19.1401	-17.9408	-19.0782	-19.8031	-23.3456	-26.4477	-30.7179	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	241.6632	213.7101	227.2737	200.6716	195.0334	176.3175	174.5562	181.2479	182.9439	203.2787	215.2209	239.1618	(64)
										Total per year (kWh/year) = Sum(64)m =		2451.0786	(64)
12Total per year (kWh/year)												2451	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	114.9510	102.1125	109.3974	98.1146	96.4773	88.4008	88.1968	90.7999	90.8245	99.5441	103.7660	113.9265	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	142.2156	157.4530	142.2156	146.9561	142.2156	146.9561	142.2156	142.2156	146.9561	142.2156	146.9561	142.2156	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	240.8328	243.3319	237.0343	223.6274	206.7036	190.7976	180.1714	177.6723	183.9699	197.3768	214.3007	230.2066	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	(71)

Water heating gains (Table 5)

	154.5040	151.9532	147.0395	136.2703	129.6738	122.7789	118.5440	122.0429	126.1452	133.7959	144.1194	153.1270	(72)

Total internal gains

	603.1319	618.3176	591.8689	572.4333	544.1725	523.1121	503.5105	504.5103	519.6507	538.9678	570.9557	591.1288	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	4.9800	19.6403	0.6300	0.7000	0.7700	29.8916	(76)
West	3.5300	19.6403	0.6300	0.7000	0.7700	21.1882	(80)

Solar gains	51.0797	99.9228	164.5586	239.9990	294.1277	301.0921	286.6519	246.2298	191.3885	118.5668	63.6904	42.0055	(83)
Total gains	654.2116	718.2404	756.4276	812.4323	838.3003	824.2042	790.1625	750.7401	711.0392	657.5346	634.6461	633.1343	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	22.0878	22.1449	22.2011	22.4689	22.5197	22.7594	22.7594	22.8043	22.6665	22.5197	22.4171	22.3109	
alpha	2.4725	2.4763	2.4801	2.4979	2.5013	2.5173	2.5173	2.5203	2.5111	2.5013	2.4945	2.4874	
util living area	0.9360	0.9177	0.8901	0.8304	0.7393	0.6039	0.4758	0.5113	0.6900	0.8457	0.9133	0.9404	(86)
MIT	18.4055	18.6788	19.1165	19.7406	20.2920	20.7078	20.8849	20.8584	20.5623	19.8623	19.0543	18.3688	(87)
Th 2	20.0133	20.0156	20.0178	20.0284	20.0304	20.0396	20.0396	20.0413	20.0360	20.0304	20.0264	20.0222	(88)
util rest of house	0.9279	0.9074	0.8758	0.8069	0.7003	0.5405	0.3887	0.4252	0.6331	0.8197	0.9008	0.9329	(89)
MIT 2	16.9801	17.3251	17.8765	18.6558	19.3201	19.7941	19.9672	19.9474	19.6441	18.8191	17.8103	16.9389	(90)
Living area fraction									fLA = Living area / (4) =			0.3196	(91)
MIT	17.4357	17.7577	18.2728	19.0025	19.6307	20.0861	20.2605	20.2386	19.9375	19.1525	18.2078	17.3959	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.4357	17.7577	18.2728	19.0025	19.6307	20.0861	20.2605	20.2386	19.9375	19.1525	18.2078	17.3959	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8993	0.8764	0.8434	0.7775	0.6822	0.5438	0.4098	0.4440	0.6266	0.7911	0.8703	0.9053	(94)
Useful gains	588.3189	629.4443	637.9923	631.6314	571.9223	448.2148	323.7839	333.2941	445.5711	520.1449	552.3117	573.1478	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1296.0984	1265.4063	1155.6998	979.9051	767.5179	525.3461	350.5219	366.8520	561.2863	827.6930	1079.9121	1289.0229	(97)
Space heating kWh	526.5880	427.3664	385.1743	250.7571	145.5232	0.0000	0.0000	0.0000	0.0000	228.8158	379.8723	532.6111	(98a)
Space heating requirement - total per year (kWh/year)												2876.7082	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	526.5880	427.3664	385.1743	250.7571	145.5232	0.0000	0.0000	0.0000	228.8158	379.8723	532.6111	(98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												2876.7082	
Space heating per m2											(98c) / (4) =	31.6261	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	526.5880	427.3664	385.1743	250.7571	145.5232	0.0000	0.0000	0.0000	0.0000	228.8158	379.8723	532.6111	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	570.5179	463.0189	417.3070	271.6761	157.6632	0.0000	0.0000	0.0000	0.0000	247.9044	411.5627	577.0434	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	241.6632	213.7101	227.2737	200.6716	195.0334	176.3175	174.5562	181.2479	182.9439	203.2787	215.2209	239.1618	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.7576	85.5823	85.2328	84.5606	83.4125	79.8000	79.8000	79.8000	79.8000	84.3258	85.3199	85.8013	(217)
Fuel for water heating, kWh/month	281.7980	249.7128	266.6504	237.3110	233.8180	220.9492	218.7421	227.1276	229.2530	241.0634	252.2517	278.7391	(219)

Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	29.5496	23.7058	21.3444	15.6378	12.0791	9.8687	11.0190	14.3229	18.6040	24.4095	27.5704	30.3709	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-38.9812	-55.1702	-79.5760	-89.7571	-96.9883	-90.5718	-89.4598	-84.3870	-75.4216	-63.2498	-42.9366	-33.6769	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-21.3144	-44.9402	-89.5251	-134.7575	-178.4789	-179.4591	-177.3409	-150.0006	-109.7478	-64.3537	-28.4842	-16.8460	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	3116.6936	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2937.4164	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	238.4821	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-2035.4247	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	4343.1674	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3116.6936	0.2100	654.5057	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2937.4164	0.2100	616.8574	(264)
Space and water heating			1271.3631	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	238.4821	0.1443	34.4203	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-840.1762	0.1345	-113.0202	
PV Unit electricity exported	-1195.2485	0.1258	-150.3985	
Total			-263.4187	(269)
Total CO2, kg/year			1054.2940	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.5900	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	3116.6936	1.1300	3521.8638	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2937.4164	1.1300	3319.2805	(278)
Space and water heating			6841.1443	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	238.4821	1.5338	365.7919	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-840.1762	1.4972	-1257.8767	
PV Unit electricity exported	-1195.2485	0.4619	-552.0620	
Total			-1809.9387	(283)
Total Primary energy kWh/year			5527.0983	(286)
Target Primary Energy Rate (TPER)			60.7600	(287)

Full SAP Calculation Printout

Property Reference	78449-06	**Issued on Date**	03/10/2025
Assessment Reference	001	**Prop Type Ref**	Mid
Property	844 Rochdale Road, MANCHESTER, M9 8FA		

SAP Rating	84 B	**DER**	3.63	**TER**	11.59
Environmental	97 A	**% DER < TER**			68.68
CO_2 Emissions (t/year)	0.32	**DFEE**	34.22	**TFEE**	37.64
Compliance Check	See BREL	**% DFEE < TFEE**			9.08
% DPER < TPER	36.77	**DPER**	38.42	**TPER**	60.76

Assessor Details	Mr. Daniel Goddard	**Assessor ID**	CP52-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	41.1800 (1b)	x	2.4800 (2b)	=	102.1264	(1b) - (3b)
First floor	49.7800 (1c)	x	2.7800 (2c)	=	138.3884	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	90.9600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	240.5148	(5)

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2. Ventilation rate

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				m3 per hour	
Number of open chimneys			0 * 80 =	0.0000	(6a)
Number of open flues			0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire			0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler			0 * 20 =	0.0000	(6d)
Number of flues attached to other heater			0 * 35 =	0.0000	(6e)
Number of blocked chimneys			0 * 20 =	0.0000	(6f)
Number of intermittent extract fans			0 * 10 =	0.0000	(7a)
Number of passive vents			0 * 10 =	0.0000	(7b)
Number of flueless gas fires			0 * 40 =	0.0000	(7c)
				Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =			0.0000 / (5) =	0.0000	(8)
Pressure test				Yes	
Pressure Test Method				Blower Door	
Measured/design AP50				5.0000	(17)
Infiltration rate				0.2500	(18)
Number of sides sheltered				2	(19)
Shelter factor			(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =	0.2125	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2709	0.2656	0.2603	0.2338	0.2284	0.2019	0.2019	0.1966	0.2125	0.2284	0.2391	0.2497	(22b)

Balanced mechanical ventilation with heat recovery		
If mechanical ventilation		(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	81.0000	(23c)

Effective ac	0.3659	0.3606	0.3553	0.3287	0.3234	0.2969	0.2969	0.2916	0.3075	0.3234	0.3341	0.3447	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door			4.1400	1.0000	4.1400			(26)
Window			8.5100	0.7752	6.5969			(27)
GF			41.1800	0.0900	3.7062	75.0000	3088.5000	(28a)
Exposed Floor			8.6000	0.1400	1.2040	20.0000	172.0000	(28b)
Main	71.8472	12.6500	59.1972	0.1300	7.6956	9.0000	532.7748	(29a)
PIJ	49.7800		49.7800	0.1300	6.4714	9.0000	448.0200	(30)
Total net area of external elements Aum(A, m2)			171.4072					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.8141			(33)
Main dwelling								
Party Wall 1			81.2200	0.0000	0.0000	20.0000	1624.4000	(32)
Timber			96.4800			9.0000	868.3200	(32c)
FF			41.1800			18.0000	741.2400	(32d)
GF			41.1800			9.0000	370.6200	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 7845.8748 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 86.2563 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	8.6300	0.1150	0.9925
E3 Sill	8.6300	0.0170	0.1467
E4 Jamb	28.2000	0.0940	2.6508
E5 Ground floor (normal)	16.6400	0.0670	1.1149
E16 Corner (normal)	4.9600	0.0680	0.3373
E12 Gable (insulation at ceiling level)	11.0000	0.0770	0.8470
E6 Intermediate floor within a dwelling	11.0000	0.0320	0.3520
E17 Corner (inverted - internal area greater than external area)	4.9600	-0.0290	-0.1438
P1 Party wall - Ground floor	12.4600	0.3200	3.9872
E20 Exposed floor (normal)	6.4400	0.0790	0.5088
E21 Exposed floor (inverted)	12.0800	0.0630	0.7610
E18 Party wall between dwellings	11.1200	0.0920	1.0230
P4 Party wall - Roof (insulation at ceiling level)	18.1000	0.1020	1.8462
E25 Staggered party wall between dwellings	9.9200	0.0560	0.5555

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 14.9790 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 44.7932 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	29.0444	28.6228	28.2011	26.0928	25.6712	23.5629	23.5629	23.1413	24.4062	25.6712	26.5145	27.3578	(38)
Heat transfer coeff	73.8376	73.4159	72.9943	70.8860	70.4644	68.3561	68.3561	67.9345	69.1994	70.4644	71.3077	72.1510	(39)
Average = Sum(39)m / 12 =												70.7806	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8118	0.8071	0.8025	0.7793	0.7747	0.7515	0.7515	0.7469	0.7608	0.7747	0.7839	0.7932	(40)
HLP (average)												0.7782	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6386 (42)
Hot water usage for mixer showers

68.4610	67.4321	65.9329	63.0644	60.9476	58.5869	57.2450	58.7329	60.3639	62.8986	65.8287	68.1987	(42a)

Hot water usage for baths

29.5637	29.1246	28.5063	27.3663	26.5127	25.5661	25.0549	25.6688	26.3373	27.3502	28.5137	29.4637	(42b)

Hot water usage for other uses

41.6522	40.1376	38.6230	37.1084	35.5937	34.0791	34.0791	35.5937	37.1084	38.6230	40.1376	41.6522	(42c)

Average daily hot water use (litres/day) 128.3946 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	139.6769	136.6944	133.0622	127.5391	123.0540	118.2321	116.3790	119.9955	123.8096	128.8717	134.4799	139.3147	(44)
Energy conte	221.2141	194.6510	204.5117	174.5947	165.6543	145.3802	140.7503	148.5795	152.6696	174.8777	191.5913	218.1331	(45)
Energy content (annual)										Total = Sum(45)m =		2132.6075	
Distribution loss (46)m = 0.15 x (45)m	33.1821	29.1976	30.6768	26.1892	24.8482	21.8070	21.1126	22.2869	22.9004	26.2317	28.7387	32.7200	(46)
Water storage loss:													
Store volume												210.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5800	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8532	(55)
Total storage loss	26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(56)
If cylinder contains dedicated solar storage	26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	270.9257	239.5518	254.2233	222.7027	215.3659	193.4882	190.4619	198.2911	200.7776	224.5893	239.6993	267.8447	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	270.9257	239.5518	254.2233	222.7027	215.3659	193.4882	190.4619	198.2911	200.7776	224.5893	239.6993	267.8447	(64)
										Total per year (kWh/year) = Sum(64)m =		2717.9215	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	113.3230	100.6421	107.7694	96.5391	94.8493	86.8253	86.5688	89.1720	89.2490	97.9161	102.1905	112.2985	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	35.2685	31.3252	25.4754	19.2865	14.4169	12.1713	13.1516	17.0949	22.9447	29.1336	34.0032	36.2488	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	359.4520	363.1820	353.7825	333.7722	308.5128	284.7725	268.9125	265.1825	274.5820	294.5923	319.8517	343.5920	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	(71)
Water heating gains (Table 5)	152.3158	149.7650	144.8514	134.0821	127.4857	120.5907	116.3559	119.8548	123.9570	131.6077	141.9313	150.9389	(72)
Total internal gains	653.2794	650.5153	630.3524	593.3839	556.6585	523.7777	504.6631	508.3753	527.7268	561.5767	602.0293	637.0228	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a	g Specific data	FF Specific data	Access factor	Gains W

					W/m2	or Table 6b		or Table 6c		Table 6d			
East					4.9800	19.6403		0.3000		0.0000	0.7700	22.5938	(76)
West					3.5300	19.6403		0.3000		0.0000	0.7700	16.0153	(80)
Solar gains	38.6090	75.5274	124.3829	181.4051	222.3188	227.5828	216.6681	186.1147	144.6625	89.6197	48.1409	31.7502	(83)
Total gains	691.8885	726.0427	754.7353	774.7891	778.9772	751.3605	721.3312	694.4900	672.3893	651.1964	650.1702	668.7729	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	29.5163	29.6858	29.8573	30.7453	30.9292	31.8832	31.8832	32.0811	31.4946	30.9292	30.5635	30.2062	
alpha	2.9678	2.9791	2.9905	3.0497	3.0619	3.1255	3.1255	3.1387	3.0996	3.0619	3.0376	3.0137	
util living area	0.9121	0.8945	0.8591	0.7899	0.6853	0.5320	0.4007	0.4290	0.6157	0.7964	0.8831	0.9178	(86)
Living	19.3133	19.5049	19.8465	20.3018	20.6541	20.8914	20.9663	20.9580	20.8180	20.3899	19.8174	19.3099	
Non living	18.6955	18.8852	19.2202	19.6711	19.9998	20.2215	20.2775	20.2763	20.1570	19.7633	19.2082	18.7041	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.1371	19.5049	19.8465	20.3018	20.6541	20.8914	20.9663	20.9580	20.8180	20.3899	19.8174	19.5463	(87)
Th 2	20.2432	20.2472	20.2512	20.2713	20.2753	20.2956	20.2956	20.2996	20.2875	20.2753	20.2673	20.2592	(88)
util rest of house	0.9031	0.8837	0.8444	0.7678	0.6515	0.4839	0.3415	0.3698	0.5690	0.7708	0.8697	0.9093	(89)
MIT 2	19.4514	18.8852	19.2202	19.6711	19.9998	20.2215	20.2775	20.2763	20.1570	19.7633	19.2082	18.9216	(90)
Living area fraction									fLA = Living area / (4) =			0.3196	(91)
MIT	19.6706	19.0833	19.4203	19.8726	20.2089	20.4356	20.4977	20.4941	20.3682	19.9636	19.4029	19.1213	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6706	19.0833	19.4203	19.8726	20.2089	20.4356	20.4977	20.4941	20.3682	19.9636	19.4029	19.1213	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8955	0.8643	0.8258	0.7545	0.6482	0.4938	0.3588	0.3866	0.5746	0.7587	0.8515	0.8941	(94)
Useful gains	619.5576	627.4984	623.2848	584.6008	504.9435	370.9896	258.8336	268.4813	386.3351	494.0863	553.6206	597.9674	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1134.9258	1041.2778	943.1111	777.8068	599.5755	398.8983	266.4298	278.1337	433.7576	659.7981	877.2884	1076.5852	(97)
Space heating kWh	383.4339	278.0598	237.9508	139.1083	70.4062	0.0000	0.0000	0.0000	0.0000	123.2896	233.0408	356.0916	(98a)
Space heating requirement - total per year (kWh/year)												1821.3810	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	383.4339	278.0598	237.9508	139.1083	70.4062	0.0000	0.0000	0.0000	0.0000	123.2896	233.0408	356.0916	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1821.3810	
Space heating per m2										(98c) / (4) =		20.0240	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	270.8847	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	383.4339	278.0598	237.9508	139.1083	70.4062	0.0000	0.0000	0.0000	0.0000	123.2896	233.0408	356.0916	(98)
Space heating efficiency (main heating system 1)	270.8847	270.8847	270.8847	270.8847	270.8847	0.0000	0.0000	0.0000	0.0000	270.8847	270.8847	270.8847	(210)
Space heating fuel (main heating system)	141.5488	102.6488	87.8421	51.3533	25.9912	0.0000	0.0000	0.0000	0.0000	45.5137	86.0295	131.4551	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	270.9257	239.5518	254.2233	222.7027	215.3659	193.4882	190.4619	198.2911	200.7776	224.5893	239.6993	267.8447	(64)
Efficiency of water heater												281.0493	(216)
(217)m	281.0493	281.0493	281.0493	281.0493	281.0493	281.0493	281.0493	281.0493	281.0493	281.0493	281.0493	281.0493	(217)
Fuel for water heating, kWh/month	96.3979	85.2348	90.4551	79.2397	76.6292	68.8449	67.7682	70.5539	71.4386	79.9110	85.2873	95.3017	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	29.6563	26.7864	29.6563	28.6997	29.6563	28.6997	29.6563	29.6563	28.6997	29.6563	28.6997	29.6563	(231)
Lighting	30.8703	24.7653	22.2984	16.3368	12.6190	10.3098	11.5115	14.9631	19.4355	25.5005	28.8027	31.7283	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	672.3824	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	281.0493	
Water heating fuel used	967.0623	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.1900)		
mechanical ventilation fans (SFP = 1.1900)	349.1794	(230a)
Total electricity for the above, kWh/year	349.1794	(231)
Electricity for lighting (calculated in Appendix L)	249.1413	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2237.7655	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	672.3824	16.4900	110.8759	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	967.0623	16.4900	159.4686	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	349.1794	16.4900	57.5797	(249)
Energy for lighting	249.1413	16.4900	41.0834	(250)
Additional standing charges			0.0000	(251)
Total energy cost			369.0075	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.9771	(257)
SAP value		84.1617	
SAP rating (Section 12)		84	(258)
SAP band		B	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	672.3824	0.1551	104.3180	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	967.0623	0.1410	136.3181	(264)
Space and water heating			240.6360	(265)
Pumps, fans and electric keep-hot	349.1794	0.1387	48.4355	(267)
Energy for lighting	249.1413	0.1443	35.9588	(268)
Total CO2, kg/year			325.0303	(272)
CO2 emissions per m2			3.5700	(273)
EI value			96.7966	
EI rating			97	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	41.1800 (1b)	x	2.4800 (2b)	=	102.1264	(1b) - (3b)
First floor	49.7800 (1c)	x	2.7800 (2c)	=	138.3884	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 90.9600						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	240.5148	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.2500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2125	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.6000	4.5000	4.5000	4.1000	4.2000	3.7000	3.5000	3.5000	3.7000	4.1000	4.1000	4.2000	(22)
Wind factor	1.1500	1.1250	1.1250	1.0250	1.0500	0.9250	0.8750	0.8750	0.9250	1.0250	1.0250	1.0500	(22a)
Adj infilt rate													
	0.2444	0.2391	0.2391	0.2178	0.2231	0.1966	0.1859	0.1859	0.1966	0.2178	0.2178	0.2231	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	81.0000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.3394	0.3341	0.3341	0.3128	0.3181	0.2916	0.2809	0.2809	0.2916	0.3128	0.3128	0.3181	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Door			4.1400	1.0000	4.1400			(26)
Window			8.5100	0.7752	6.5969			(27)
GF			41.1800	0.0900	3.7062	75.0000	3088.5000	(28a)
Exposed Floor			8.6000	0.1400	1.2040	20.0000	172.0000	(28b)
Main	71.8472	12.6500	59.1972	0.1300	7.6956	9.0000	532.7748	(29a)
PIJ	49.7800		49.7800	0.1300	6.4714	9.0000	448.0200	(30)
Total net area of external elements Aum(A, m2)			171.4072					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.8141			(33)
Main dwelling								
Party Wall 1			81.2200	0.0000	0.0000	20.0000	1624.4000	(32)
Timber			96.4800			9.0000	868.3200	(32c)
FF			41.1800			18.0000	741.2400	(32d)
GF			41.1800			9.0000	370.6200	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	7845.8748 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		86.2563 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	8.6300	0.1150	0.9925
E3 Sill	8.6300	0.0170	0.1467
E4 Jamb	28.2000	0.0940	2.6508
E5 Ground floor (normal)	16.6400	0.0670	1.1149
E16 Corner (normal)	4.9600	0.0680	0.3373
E12 Gable (insulation at ceiling level)	11.0000	0.0770	0.8470
E6 Intermediate floor within a dwelling	11.0000	0.0320	0.3520
E17 Corner (inverted - internal area greater than external area)	4.9600	-0.0290	-0.1438
P1 Party wall - Ground floor	12.4600	0.3200	3.9872
E20 Exposed floor (normal)	6.4400	0.0790	0.5088
E21 Exposed floor (inverted)	12.0800	0.0630	0.7610
E18 Party wall between dwellings	11.1200	0.0920	1.0230
P4 Party wall - Roof (insulation at ceiling level)	18.1000	0.1020	1.8462
E25 Staggered party wall between dwellings	9.9200	0.0560	0.5555

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		14.9790 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	44.7932 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	26.9362	26.5145	26.5145	24.8279	25.2495	23.1413	22.2980	22.2980	23.1413	24.8279	24.8279	25.2495	(38)
Heat transfer coeff													
	71.7293	71.3077	71.3077	69.6211	70.0427	67.9345	67.0912	67.0912	67.9345	69.6211	69.6211	70.0427	(39)
Average = Sum(39)m / 12 =												69.4454	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7886	0.7839	0.7839	0.7654	0.7700	0.7469	0.7376	0.7376	0.7469	0.7654	0.7654	0.7700	(40)
HLP (average)												0.7635	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.6386	(42)

Hot water usage for mixer showers

68.4610	67.4321	65.9329	63.0644	60.9476	58.5869	57.2450	58.7329	60.3639	62.8986	65.8287	68.1987	(42a)

Hot water usage for baths

29.5637	29.1246	28.5063	27.3663	26.5127	25.5661	25.0549	25.6688	26.3373	27.3502	28.5137	29.4637	(42b)

Hot water usage for other uses

41.6522	40.1376	38.6230	37.1084	35.5937	34.0791	34.0791	35.5937	37.1084	38.6230	40.1376	41.6522	(42c)

Average daily hot water use (litres/day)	128.3946	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	139.6769	136.6944	133.0622	127.5391	123.0540	118.2321	116.3790	119.9955	123.8096	128.8717	134.4799	139.3147	(44)
Energy conte	221.2141	194.6510	204.5117	174.5947	165.6543	145.3802	140.7503	148.5795	152.6696	174.8777	191.5913	218.1331	(45)
Energy content (annual)										Total = Sum(45)m =		2132.6075	
Distribution loss (46)m = 0.15 x (45)m													
	33.1821	29.1976	30.6768	26.1892	24.8482	21.8070	21.1126	22.2869	22.9004	26.2317	28.7387	32.7200	(46)

Water storage loss:		
Store volume	210.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):	1.5800	(48)
Temperature factor from Table 2b	0.5400	(49)
Enter (49) or (54) in (55)	0.8532	(55)

Total storage loss

26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(56)

If cylinder contains dedicated solar storage

26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(57)

Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	270.9257	239.5518	254.2233	222.7027	215.3659	193.4882	190.4619	198.2911	200.7776	224.5893	239.6993	267.8447	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	270.9257	239.5518	254.2233	222.7027	215.3659	193.4882	190.4619	198.2911	200.7776	224.5893	239.6993	267.8447	(64)
										Total per year (kWh/year) = Sum(64)m =		2717.9215	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	113.3230	100.6421	107.7694	96.5391	94.8493	86.8253	86.5688	89.1720	89.2490	97.9161	102.1905	112.2985	(65)

5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	35.2685	31.3252	25.4754	19.2865	14.4169	12.1713	13.1516	17.0949	22.9447	29.1336	34.0032	36.2488	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	359.4520	363.1820	353.7825	333.7722	308.5128	284.7725	268.9125	265.1825	274.5820	294.5923	319.8517	343.5920	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	(71)
Water heating gains (Table 5)													
	152.3158	149.7650	144.8514	134.0821	127.4857	120.5907	116.3559	119.8548	123.9570	131.6077	141.9313	150.9389	(72)
Total internal gains													
	653.2794	650.5153	630.3524	593.3839	556.6585	523.7777	504.6631	508.3753	527.7268	561.5767	602.0293	637.0228	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	4.9800	16.6187	0.3000	0.0000	0.7700	19.1178	(76)
West	3.5300	16.6187	0.3000	0.0000	0.7700	13.5514	(80)

Solar gains	32.6692	67.1355	116.6090	172.9395	207.2659	216.2037	201.7650	170.7039	137.1149	82.8303	42.3057	28.7264	(83)
Total gains	685.9486	717.6508	746.9614	766.3235	763.9244	739.9813	706.4281	679.0793	664.8417	644.4070	644.3350	665.7491	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	30.3838	30.5635	30.5635	31.3039	31.1154	32.0811	32.4843	32.4843	32.0811	31.3039	31.3039	31.1154	
alpha	3.0256	3.0376	3.0376	3.0869	3.0744	3.1387	3.1656	3.1656	3.1387	3.0869	3.0869	3.0744	
util living area													
	0.9068	0.8885	0.8547	0.7779	0.6639	0.5092	0.4021	0.4249	0.6142	0.7907	0.8753	0.9119	(86)
Living	19.4513	19.6333	19.9188	20.3753	20.7083	20.9113	20.9677	20.9614	20.8259	20.4264	19.9252	19.4545	
Non living	18.8455	19.0256	19.3024	19.7502	20.0520	20.2411	20.2904	20.2865	20.1745	19.8040	19.3250	18.8607	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.2077	19.6333	19.9188	20.3753	20.7083	20.9113	20.9677	20.9614	20.8259	20.4264	19.9252	19.6707	(87)
Th 2	20.2632	20.2673	20.2673	20.2834	20.2794	20.2996	20.3077	20.3077	20.2996	20.2834	20.2834	20.2794	(88)
util rest of house													
	0.8972	0.8771	0.8397	0.7545	0.6273	0.4591	0.3436	0.3654	0.5682	0.7644	0.8610	0.9028	(89)
MIT 2	19.5380	19.0256	19.3024	19.7502	20.0520	20.2411	20.2904	20.2865	20.1745	19.8040	19.3250	19.0592	(90)
Living area fraction										fLA = Living area / (4) =		0.3196	(91)
MIT	19.7520	19.2198	19.4994	19.9500	20.2617	20.4553	20.5069	20.5022	20.3827	20.0029	19.5168	19.2546	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7520	19.2198	19.4994	19.9500	20.2617	20.4553	20.5069	20.5022	20.3827	20.0029	19.5168	19.2546	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8898	0.8583	0.8219	0.7427	0.6263	0.4706	0.3608	0.3825	0.5739	0.7531	0.8436	0.8880	(94)
Useful gains	610.3675	615.9874	613.9316	569.1664	478.4751	348.2089	254.8526	259.7206	381.5666	485.3317	543.5328	591.1572	(95)
Ext temp.	4.7000	5.3000	6.7000	9.3000	12.3000	15.0000	16.6000	16.5000	14.1000	10.8000	7.5000	4.6000	(96)
Heat loss rate W													
	1079.6717	992.5909	912.6936	741.4636	557.6596	370.6022	262.1157	268.5111	426.8125	640.7179	836.6232	1026.4484	(97)
Space heating kWh													
	349.1623	253.0776	222.2789	124.0540	58.9133	0.0000	0.0000	0.0000	0.0000	115.6073	211.0251	323.8566	(98a)
Space heating requirement - total per year (kWh/year)												1657.9750	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	349.1623	253.0776	222.2789	124.0540	58.9133	0.0000	0.0000	0.0000	0.0000	115.6073	211.0251	323.8566	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1657.9750	
Space heating per m2											(98c) / (4) =	18.2275	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												269.9311	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	349.1623	253.0776	222.2789	124.0540	58.9133	0.0000	0.0000	0.0000	0.0000	115.6073	211.0251	323.8566	(98)
Space heating efficiency (main heating system 1)													
	269.9311	269.9311	269.9311	269.9311	269.9311	0.0000	0.0000	0.0000	0.0000	269.9311	269.9311	269.9311	(210)
Space heating fuel (main heating system)													
	129.3524	93.7564	82.3465	45.9576	21.8253	0.0000	0.0000	0.0000	0.0000	42.8284	78.1774	119.9775	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	270.9257	239.5518	254.2233	222.7027	215.3659	193.4882	190.4619	198.2911	200.7776	224.5893	239.6993	267.8447	(64)
Efficiency of water heater												281.3569	(216)
(217)m	281.3569	281.3569	281.3569	281.3569	281.3569	281.3569	281.3569	281.3569	281.3569	281.3569	281.3569	281.3569	(217)
Fuel for water heating, kWh/month													
	96.2925	85.1416	90.3562	79.1531	76.5455	68.7697	67.6941	70.4767	71.3605	79.8236	85.1940	95.1975	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	29.6563	26.7864	29.6563	28.6997	29.6563	28.6997	29.6563	29.6563	28.6997	29.6563	28.6997	29.6563	(231)
Lighting	30.8703	24.7653	22.2984	16.3368	12.6190	10.3098	11.5115	14.9631	19.4355	25.5005	28.8027	31.7283	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												614.2216	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												281.3569	
Water heating fuel used												966.0048	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.1900)													
mechanical ventilation fans (SFP = 1.1900)												349.1794	(230a)
Total electricity for the above, kWh/year												349.1794	(231)
Electricity for lighting (calculated in Appendix L)												249.1413	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												2178.5472	(238)

10a. Fuel costs - using BEDF prices (583)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	614.2216	28.4300	174.6232	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	966.0048	28.4300	274.6352	(247)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(247a)
Pumps, fans and electric keep-hot	349.1794	28.4300	99.2717	(249)
Energy for lighting	249.1413	28.4300	70.8309	(250)
Additional standing charges			0.0000	(251)
Total energy cost			619.3610	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	614.2216	0.1552	95.3232	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	966.0048	0.1410	136.1690	(264)
Space and water heating			231.4921	(265)
Pumps, fans and electric keep-hot	349.1794	0.1387	48.4355	(267)
Energy for lighting	249.1413	0.1443	35.9588	(268)
Total CO2, kg/year			315.8864	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	614.2216	1.5746	967.1236	(275)
Total CO2 associated with community systems			0.0000	(473)

Water heating (other fuel)	966.0048	1.5212	1469.5113 (278)
Space and water heating			2436.6349 (279)
Pumps, fans and electric keep-hot	349.1794	1.5128	528.2386 (281)
Energy for lighting	249.1413	1.5338	382.1413 (282)
Total Primary energy kWh/year			3347.0147 (286)

SAP 10 EPC IMPROVEMENTS

001

Current energy efficiency rating: B 84
Current environmental impact rating: A 97

N Solar water heating	Recommended
U Solar photovoltaic panels	Recommended
V2 Wind turbine	Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
N Solar water heating	+ 1.4	-£ 53	-23 kg (7.2%)
U Solar photovoltaic panels	+ 8.2	-£ 277	-207 kg (70.6%)

	Typical annual savings		Energy efficiency	Environmental impact
Recommended measures				
Solar water heating	£53	0.25 kg/m²	B 86	A 97
Solar photovoltaic panels	£277	2.27 kg/m²	A 94	A 99
Total Savings	£330	2.52 kg/m²		

Potential energy efficiency rating: A 94
Potential environmental impact rating: A 99

Fuel prices for cost data on this page from database revision number 583 TEST (01 Oct 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, West Pennines (England)):

	Current	Potential	Saving
Electricity	£619	£567	£53
Space heating	£274	£300	-£26
Water heating	£275	£196	£78
Lighting	£71	£71	£0
Generated (PV)	-£0	-£277	£277
Total cost of fuels	£619	£290	£330
Total cost of uses	£620	£290	£329
Delivered energy	24 kWh/m²	4 kWh/m²	20 kWh/m²
Carbon dioxide emissions	0.3 tonnes	0.1 tonnes	0.2 tonnes
CO2 emissions per m²	3 kg/m²	1 kg/m²	3 kg/m²
Primary energy	37 kWh/m²	17 kWh/m²	20 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	41.1800 (1b)	x	2.4800 (2b)	=	102.1264	(1b) - (3b)
First floor	49.7800 (1c)	x	2.7800 (2c)	=	138.3884	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	90.9600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	240.5148	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.2500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2125	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													
	0.2709	0.2656	0.2603	0.2338	0.2284	0.2019	0.2019	0.1966	0.2125	0.2284	0.2391	0.2497	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	81.0000	(23c)

Effective ac	0.3659	0.3606	0.3553	0.3287	0.3234	0.2969	0.2969	0.2916	0.3075	0.3234	0.3341	0.3447	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Door			4.1400	1.0000	4.1400			(26)
Window			8.5100	0.7752	6.5969			(27)
GF			41.1800	0.0900	3.7062	75.0000	3088.5000	(28a)
Exposed Floor			8.6000	0.1400	1.2040	20.0000	172.0000	(28b)
Main	71.8472	12.6500	59.1972	0.1300	7.6956	9.0000	532.7748	(29a)
PIJ	49.7800		49.7800	0.1300	6.4714	9.0000	448.0200	(30)
Total net area of external elements Aum(A, m2)			171.4072					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.8141			(33)
Main dwelling								
Party Wall 1			81.2200	0.0000	0.0000	20.0000	1624.4000	(32)
Timber			96.4800			9.0000	868.3200	(32c)
FF			41.1800			18.0000	741.2400	(32d)
GF			41.1800			9.0000	370.6200	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 7845.8748	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	86.2563	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	8.6300	0.1150	0.9925
E3 Sill	8.6300	0.0170	0.1467
E4 Jamb	28.2000	0.0940	2.6508
E5 Ground floor (normal)	16.6400	0.0670	1.1149
E16 Corner (normal)	4.9600	0.0680	0.3373
E12 Gable (insulation at ceiling level)	11.0000	0.0770	0.8470
E6 Intermediate floor within a dwelling	11.0000	0.0320	0.3520
E17 Corner (inverted - internal area greater than external area)	4.9600	-0.0290	-0.1438
P1 Party wall - Ground floor	12.4600	0.3200	3.9872
E20 Exposed floor (normal)	6.4400	0.0790	0.5088
E21 Exposed floor (inverted)	12.0800	0.0630	0.7610
E18 Party wall between dwellings	11.1200	0.0920	1.0230
P4 Party wall - Roof (insulation at ceiling level)	18.1000	0.1020	1.8462
E25 Staggered party wall between dwellings	9.9200	0.0560	0.5555

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	14.9790	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	44.7932	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	29.0444	28.6228	28.2011	26.0928	25.6712	23.5629	23.5629	23.1413	24.4062	25.6712	26.5145	27.3578	(38)
Heat transfer coeff													
	73.8376	73.4159	72.9943	70.8860	70.4644	68.3561	68.3561	67.9345	69.1994	70.4644	71.3077	72.1510	(39)
Average = Sum(39)m / 12 =												70.7806	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8118	0.8071	0.8025	0.7793	0.7747	0.7515	0.7515	0.7469	0.7608	0.7747	0.7839	0.7932	(40)
HLP (average)												0.7782	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.6386	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
68.4610	67.4321	65.9329	63.0644	60.9476	58.5869	57.2450	58.7329	60.3639	62.8986	65.8287	68.1987	(42a)

Hot water usage for baths

29.5637	29.1246	28.5063	27.3663	26.5127	25.5661	25.0549	25.6688	26.3373	27.3502	28.5137	29.4637	(42b)

Hot water usage for other uses

41.6522	40.1376	38.6230	37.1084	35.5937	34.0791	34.0791	35.5937	37.1084	38.6230	40.1376	41.6522	(42c)

Average daily hot water use (litres/day)	128.3946	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	139.6769	136.6944	133.0622	127.5391	123.0540	118.2321	116.3790	119.9955	123.8096	128.8717	134.4799	139.3147	(44)
Energy conte	221.2141	194.6510	204.5117	174.5947	165.6543	145.3802	140.7503	148.5795	152.6696	174.8777	191.5913	218.1331	(45)
Energy content (annual)											Total = Sum(45)m =	2132.6075	
Distribution loss (46)m = 0.15 x (45)m													
	33.1821	29.1976	30.6768	26.1892	24.8482	21.8070	21.1126	22.2869	22.9004	26.2317	28.7387	32.7200	(46)

Water storage loss:		
Store volume	210.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):	1.5800	(48)
Temperature factor from Table 2b	0.5400	(49)
Enter (49) or (54) in (55)	0.8532	(55)

Total storage loss

26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(56)

If cylinder contains dedicated solar storage

17.0031	15.3576	17.0031	16.4546	17.0031	16.4546	17.0031	17.0031	16.4546	17.0031	16.4546	17.0031	(57)
Primary loss 23.2624	21.0112	21.8667	15.7584	10.4681	9.9053	10.2355	11.1660	17.1091	21.8667	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

261.4795	231.0198	243.3814	206.8077	193.1255	171.7400	167.9889	176.7485	186.2333	213.7474	230.5579	258.3985	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)

Aperture area of solar collector	3.0000	(H1)
Zero-loss collector efficiency	0.8000	(H2)
Collector linear heat loss coefficient	1.8000	(H3)
Collector 2nd order heat loss coefficient	0.0000	(H4)
Collector loop efficiency	0.9000	(H5)
Incidence angle modifier	1.0000	(H6)

Overshading factor												0.8000	(H8)
Overall heat loss coefficient of system												6.5000	(H10)
Heat loss coefficient of collector loop												3.9667	(H11)
Dedicated solar storage volume												75.0000	(H12)
If combined cylinder, total volume of cylinder												210.0000	(H13)
Effective solar volume												115.5000	(H14)
Reference volume												225.0000	(H15)
Storage tank correction coefficient												1.1814	(H16)
Heat delivered to hot water												654.6757	(H24)
Heat delivered to space heating												0.0000	(H29)
Solar input												654.6757	
Solar input	-0.0000	-20.1906	-62.4438	-83.8682	-107.6151	-99.0457	-98.2732	-86.8675	-61.6791	-33.2791	-1.4133	-0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	261.4795	210.8291	180.9377	122.9394	85.5104	72.6943	69.7156	89.8809	124.5542	180.4683	229.1446	258.3985	(64)
									Total per year (kWh/year) = Sum(64)m =			1886.5527	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
								Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =				0.0000	(64a)
Heat gains from water heating, kWh/month													
	105.7660	93.8165	99.0959	83.8231	77.0570	69.4268	68.5903	71.9379	77.6136	89.2426	94.8774	104.7416	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	35.2685	31.3252	25.4754	19.2865	14.4169	12.1713	13.1516	17.0949	22.9447	29.1336	34.0032	36.2488	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	359.4520	363.1820	353.7825	333.7722	308.5128	284.7725	268.9125	265.1825	274.5820	294.5923	319.8517	343.5920	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	(71)
Water heating gains (Table 5)													
	142.1587	139.6079	133.1934	116.4210	103.5712	96.4261	92.1913	96.6907	107.7967	119.9497	131.7741	140.7817	(72)
Total internal gains													
	643.1223	640.3582	618.6944	575.7228	532.7440	499.6131	480.4985	485.2112	511.5665	549.9188	591.8722	626.8656	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	4.9800	19.6403	0.3000	0.0000	0.7700	22.5938	(76)
West	3.5300	19.6403	0.3000	0.0000	0.7700	16.0153	(80)

Solar gains	38.6090	75.5274	124.3829	181.4051	222.3188	227.5828	216.6681	186.1147	144.6625	89.6197	48.1409	31.7502	(83)
Total gains	681.7313	715.8856	743.0774	757.1279	755.0628	727.1959	697.1666	671.3260	656.2290	639.5384	640.0131	658.6158	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	29.5163	29.6858	29.8573	30.7453	30.9292	31.8832	31.8832	32.0811	31.4946	30.9292	30.5635	30.2062	
alpha	2.9678	2.9791	2.9905	3.0497	3.0619	3.1255	3.1255	3.1387	3.0996	3.0619	3.0376	3.0137	
util living area													
	0.9149	0.8975	0.8632	0.7979	0.6981	0.5458	0.4131	0.4419	0.6261	0.8025	0.8868	0.9205	(86)
Living	19.2926	19.4854	19.8269	20.2792	20.6349	20.8832	20.9633	20.9544	20.8091	20.3747	19.7986	19.2886	
Non living	18.6754	18.8666	19.2017	19.6505	19.9836	20.2157	20.2759	20.2741	20.1501	19.7496	19.1904	18.6835	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.1265	19.4854	19.8269	20.2792	20.6349	20.8832	20.9633	20.9544	20.8091	20.3747	19.7986	19.5280	(87)
Th 2	20.2432	20.2472	20.2512	20.2713	20.2753	20.2956	20.2956	20.2996	20.2875	20.2753	20.2673	20.2592	(88)
util rest of house													
	0.9060	0.8870	0.8488	0.7761	0.6646	0.4972	0.3525	0.3814	0.5794	0.7774	0.8737	0.9123	(89)
MIT 2	19.4412	18.8666	19.2017	19.6505	19.9836	20.2157	20.2759	20.2741	20.1501	19.7496	19.1904	18.9039	(90)
Living area fraction										fLA = Living area / (4) =		0.3196	(91)
MIT	19.6602	19.0644	19.4015	19.8514	20.1917	20.4290	20.4956	20.4915	20.3607	19.9494	19.3848	19.1034	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6602	19.0644	19.4015	19.8514	20.1917	20.4290	20.4956	20.4915	20.3607	19.9494	19.3848	19.1034	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8985	0.8676	0.8301	0.7624	0.6605	0.5067	0.3701	0.3984	0.5845	0.7649	0.8555	0.8972	(94)
Useful gains	612.5056	621.0786	616.8621	577.2369	498.7053	368.4672	258.0023	267.4529	383.5338	489.1698	547.5142	590.8996	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1134.1604	1039.8893	941.7389	776.3046	598.3657	398.4481	266.2854	277.9551	433.2382	658.7983	875.9978	1075.2926	(97)
Space heating kWh													
	388.1112	281.4408	241.7084	143.3288	74.1473	0.0000	0.0000	0.0000	0.0000	126.2036	236.5082	360.3884	(98a)
Space heating requirement - total per year (kWh/year)												1851.8366	
Solar heating kWh													
	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	388.1112	281.4408	241.7084	143.3288	74.1473	0.0000	0.0000	0.0000	0.0000	126.2036	236.5082	360.3884	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1851.8366	
Space heating per m2											(98c) / (4) =	20.3588	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												270.8847	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	388.1112	281.4408	241.7084	143.3288	74.1473	0.0000	0.0000	0.0000	0.0000	126.2036	236.5082	360.3884	(98)
Space heating efficiency (main heating system 1)													
	270.8847	270.8847	270.8847	270.8847	270.8847	0.0000	0.0000	0.0000	0.0000	270.8847	270.8847	270.8847	(210)
Space heating fuel (main heating system)													
	143.2754	103.8969	89.2293	52.9114	27.3723	0.0000	0.0000	0.0000	0.0000	46.5894	87.3095	133.0413	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	261.4795	210.8291	180.9377	122.9394	85.5104	72.6943	69.7156	89.8809	124.5542	180.4683	229.1446	258.3985	(64)
Efficiency of water heater												281.0493	(216)
(217)m	281.0493	281.0493	281.0493	281.0493	281.0493	281.0493	281.0493	281.0493	281.0493	281.0493	281.0493	281.0493	(217)
Fuel for water heating, kWh/month													
	93.0369	75.0150	64.3793	43.7430	30.4254	25.8653	24.8055	31.9805	44.3176	64.2123	81.5318	91.9407	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	36.4509	32.9233	36.4509	35.2750	36.4509	35.2750	36.4509	36.4509	35.2750	36.4509	35.2750	36.4509	(231)
Lighting	30.8703	24.7653	22.2984	16.3368	12.6190	10.3098	11.5115	14.9631	19.4355	25.5005	28.8027	31.7283	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-37.4213	-55.2968	-82.6096	-94.8967	-102.3683	-93.3004	-92.1878	-86.5597	-76.2056	-63.7310	-41.7430	-31.9501	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-12.6652	-28.2832	-59.7367	-95.8754	-133.3145	-138.4133	-136.4638	-113.2143	-80.2575	-43.1148	-17.6668	-9.9637	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												683.6254	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												281.0493	
Water heating fuel used												671.2534	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.1900)													
mechanical ventilation fans (SFP = 1.1900)												349.1794	(230a)
pump for solar water heating												80.0000	(230g)
Total electricity for the above, kWh/year												429.1794	(231)
Electricity for lighting (calculated in Appendix L)												249.1413	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1727.2394	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												305.9602	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	683.6254	16.4900	112.7298	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	671.2534	16.4900	110.6897	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	349.1794	16.4900	57.5797	(249)
Pump for solar water heating	80.0000	16.4900	13.1920	(249)
Energy for lighting	249.1413	16.4900	41.0834	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-858.2703	16.4900	-141.5288	
PV Unit electricity exported	-868.9691	5.5900	-48.5754	
Total			-190.1041	(252)
Total energy cost			145.1705	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.3844	(257)
SAP value		93.7691	
SAP rating (Section 12)		94	(258)
SAP band		A	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	683.6254	0.1551	106.0146	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	671.2534	0.1462	98.1652	(264)
Space and water heating			204.1797	(265)
Pumps, fans and electric keep-hot	429.1794	0.1387	59.5325	(267)
Energy for lighting	249.1413	0.1443	35.9588	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-858.2703	0.1343	-115.2684	
PV Unit electricity exported	-868.9691	0.1239	-107.6587	
Total			-222.9271	(269)
Total CO2, kg/year			76.7439	(272)
CO2 emissions per m2			0.8400	(273)
EI value			99.2436	
EI rating			99	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	41.1800	(1b) x	2.4800	(2b) =	102.1264	(1b) - (3b)
First floor	49.7800	(1c) x	2.7800	(2c) =	138.3884	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	90.9600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		240.5148	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.2500 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2125 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.6000	4.5000	4.5000	4.1000	4.2000	3.7000	3.5000	3.5000	3.7000	4.1000	4.1000	4.2000	(22)
Wind factor	1.1500	1.1250	1.1250	1.0250	1.0500	0.9250	0.8750	0.8750	0.9250	1.0250	1.0250	1.0500	(22a)
Adj infilt rate	0.2444	0.2391	0.2391	0.2178	0.2231	0.1966	0.1859	0.1859	0.1966	0.2178	0.2178	0.2231	(22b)
Balanced mechanical ventilation with heat recovery													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												81.0000	(23c)
Effective ac	0.3394	0.3341	0.3341	0.3128	0.3181	0.2916	0.2809	0.2809	0.2916	0.3128	0.3128	0.3181	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door			4.1400	1.0000	4.1400			(26)
Window			8.5100	0.7752	6.5969			(27)
GF			41.1800	0.0900	3.7062	75.0000	3088.5000	(28a)
Exposed Floor			8.6000	0.1400	1.2040	20.0000	172.0000	(28b)
Main	71.8472	12.6500	59.1972	0.1300	7.6956	9.0000	532.7748	(29a)
PIJ	49.7800		49.7800	0.1300	6.4714	9.0000	448.0200	(30)
Total net area of external elements Aum(A, m2)			171.4072					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.8141			(33)
Main dwelling								
Party Wall 1			81.2200	0.0000	0.0000	20.0000	1624.4000	(32)
Timber			96.4800			9.0000	868.3200	(32c)
FF			41.1800			18.0000	741.2400	(32d)
GF			41.1800			9.0000	370.6200	(32e)
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =			7845.8748	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 86.2563 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	8.6300	0.1150	0.9925
E3 Sill	8.6300	0.0170	0.1467
E4 Jamb	28.2000	0.0940	2.6508
E5 Ground floor (normal)	16.6400	0.0670	1.1149
E16 Corner (normal)	4.9600	0.0680	0.3373
E12 Gable (insulation at ceiling level)	11.0000	0.0770	0.8470
E6 Intermediate floor within a dwelling	11.0000	0.0320	0.3520
E17 Corner (inverted - internal area greater than external area)	4.9600	-0.0290	-0.1438
P1 Party wall - Ground floor	12.4600	0.3200	3.9872
E20 Exposed floor (normal)	6.4400	0.0790	0.5088
E21 Exposed floor (inverted)	12.0800	0.0630	0.7610
E18 Party wall between dwellings	11.1200	0.0920	1.0230
P4 Party wall - Roof (insulation at ceiling level)	18.1000	0.1020	1.8462
E25 Staggered party wall between dwellings	9.9200	0.0560	0.5555

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 14.9790 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 44.7932 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	26.9362	26.5145	26.5145	24.8279	25.2495	23.1413	22.2980	22.2980	23.1413	24.8279	24.8279	25.2495	(38)
Heat transfer coeff	71.7293	71.3077	71.3077	69.6211	70.0427	67.9345	67.0912	67.0912	67.9345	69.6211	69.6211	70.0427	(39)
Average = Sum(39)m / 12 =												69.4454	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7886	0.7839	0.7839	0.7654	0.7700	0.7469	0.7376	0.7376	0.7469	0.7654	0.7654	0.7700	(40)
HLP (average)												0.7635	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6386 (42)
Hot water usage for mixer showers

68.4610	67.4321	65.9329	63.0644	60.9476	58.5869	57.2450	58.7329	60.3639	62.8986	65.8287	68.1987	(42a)

Hot water usage for baths

29.5637	29.1246	28.5063	27.3663	26.5127	25.5661	25.0549	25.6688	26.3373	27.3502	28.5137	29.4637	(42b)

Hot water usage for other uses

41.6522	40.1376	38.6230	37.1084	35.5937	34.0791	34.0791	35.5937	37.1084	38.6230	40.1376	41.6522	(42c)

Average daily hot water use (litres/day) 128.3946 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	139.6769	136.6944	133.0622	127.5391	123.0540	118.2321	116.3790	119.9955	123.8096	128.8717	134.4799	139.3147	(44)
Energy conte	221.2141	194.6510	204.5117	174.5947	165.6543	145.3802	140.7503	148.5795	152.6696	174.8777	191.5913	218.1331	(45)
Energy content (annual)										Total = Sum(45)m =		2132.6075	

Distribution loss (46)m = 0.15 x (45)m

33.1821	29.1976	30.6768	26.1892	24.8482	21.8070	21.1126	22.2869	22.9004	26.2317	28.7387	32.7200	(46)

Water storage loss:
Store volume 210.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.5800 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.8532 (55)
Total storage loss

26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(56)

If cylinder contains dedicated solar storage

17.0031	15.3576	17.0031	16.4546	17.0031	16.4546	17.0031	17.0031	16.4546	17.0031	16.4546	17.0031	(57)
23.2624	21.0112	21.8667	15.7584	10.4681	9.9053	10.2355	11.1660	17.1091	21.8667	22.5120	23.2624	(59)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

261.4795	231.0198	243.3814	206.8077	193.1255	171.7400	167.9889	176.7485	186.2333	213.7474	230.5579	258.3985	(62)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)

Aperture area of solar collector 3.0000 (H1)
Zero-loss collector efficiency 0.8000 (H2)
Collector linear heat loss coefficient 1.8000 (H3)
Collector 2nd order heat loss coefficient 0.0000 (H4)
Collector loop efficiency 0.9000 (H5)
Incidence angle modifier 1.0000 (H6)
Overshading factor 0.8000 (H8)
Overall heat loss coefficient of system 6.5000 (H10)
Heat loss coefficient of collector loop 3.9667 (H11)
Dedicated solar storage volume 75.0000 (H12)
If combined cylinder, total volume of cylinder 210.0000 (H13)
Effective solar volume 115.5000 (H14)
Reference volume 225.0000 (H15)
Storage tank correction coefficient 1.1814 (H16)
Heat delivered to hot water 599.1897 (H24)
Heat delivered to space heating 0.0000 (H29)
Solar input 599.1897

-0.0000	-14.4822	-56.8249	-79.3403	-100.2904	-94.0949	-90.8995	-78.3168	-56.9604	-27.9802	-0.0000	-0.0000	(63c)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

261.4795	216.5376	186.5565	127.4673	92.8350	77.6451	77.0894	98.4317	129.2728	185.7672	230.5579	258.3985	(64)
									Total per year (kWh/year) = Sum(64)m =		1942.0387	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)

Heat gains from water heating, kWh/month

105.7660	93.8165	99.0959	83.8231	77.0570	69.4268	68.5903	71.9379	77.6136	89.2426	94.8774	104.7416	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	35.2685	31.3252	25.4754	19.2865	14.4169	12.1713	13.1516	17.0949	22.9447	29.1336	34.0032	36.2488	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	359.4520	363.1820	353.7825	333.7722	308.5128	284.7725	268.9125	265.1825	274.5820	294.5923	319.8517	343.5920	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	(69)

Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	(71)
Water heating gains (Table 5)	142.1587	139.6079	133.1934	116.4210	103.5712	96.4261	92.1913	96.6907	107.7967	119.9497	131.7741	140.7817	(72)
Total internal gains	643.1223	640.3582	618.6944	575.7228	532.7440	499.6131	480.4985	485.2112	511.5665	549.9188	591.8722	626.8656	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	4.9800	16.6187	0.3000	0.0000	0.7700	19.1178	(76)
West	3.5300	16.6187	0.3000	0.0000	0.7700	13.5514	(80)

Solar gains	32.6692	67.1355	116.6090	172.9395	207.2659	216.2037	201.7650	170.7039	137.1149	82.8303	42.3057	28.7264	(83)
Total gains	675.7915	707.4937	735.3035	748.6623	740.0099	715.8167	682.2635	655.9152	648.6814	632.7491	634.1778	655.5920	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	30.3838	30.5635	30.5635	31.3039	31.1154	32.0811	32.4843	32.4843	32.0811	31.3039	31.3039	31.1154	
alpha	3.0256	3.0376	3.0376	3.0869	3.0744	3.1387	3.1656	3.1656	3.1387	3.0869	3.0869	3.0744	
util living area	0.9097	0.8917	0.8591	0.7862	0.6771	0.5231	0.4148	0.4381	0.6248	0.7970	0.8793	0.9148	(86)
Living	19.4308	19.6142	19.8995	20.3539	20.6910	20.9043	20.9647	20.9579	20.8171	20.4115	19.9069	19.4335	
Non living	18.8258	19.0073	19.2842	19.7308	20.0377	20.2363	20.2887	20.2845	20.1678	19.7907	19.3077	18.8405	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.1973	19.6142	19.8995	20.3539	20.6910	20.9043	20.9647	20.9579	20.8171	20.4115	19.9069	19.6526	(87)
Th 2	20.2632	20.2673	20.2673	20.2834	20.2794	20.2996	20.3077	20.3077	20.2996	20.2834	20.2834	20.2794	(88)
util rest of house	0.9004	0.8806	0.8443	0.7633	0.6408	0.4723	0.3550	0.3772	0.5788	0.7711	0.8653	0.9060	(89)
MIT 2	19.5279	19.0073	19.2842	19.7308	20.0377	20.2363	20.2887	20.2845	20.1678	19.7907	19.3077	19.0418	(90)
Living area fraction									fLA = Living area / (4) =			0.3196	(91)
MIT	19.7418	19.2013	19.4809	19.9299	20.2465	20.4498	20.5048	20.4997	20.3753	19.9891	19.4992	19.2370	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7418	19.2013	19.4809	19.9299	20.2465	20.4498	20.5048	20.4997	20.3753	19.9891	19.4992	19.2370	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8930	0.8618	0.8264	0.7509	0.6390	0.4835	0.3723	0.3945	0.5840	0.7595	0.8478	0.8912	(94)
Useful gains	603.4859	609.7347	607.6374	562.2002	472.8993	346.0816	254.0301	258.7483	378.8167	480.5478	537.6294	584.2708	(95)
Ext temp.	4.7000	5.3000	6.7000	9.3000	12.3000	15.0000	16.6000	16.5000	14.1000	10.8000	7.5000	4.6000	(96)
Heat loss rate W	1078.9393	991.2675	911.3729	740.0682	556.5933	370.2267	261.9745	268.3436	426.3094	639.7559	835.3990	1025.2150	(97)
Space heating kWh	353.7374	256.3901	225.9792	128.0650	62.2683	0.0000	0.0000	0.0000	0.0000	118.4508	214.3941	328.0625	(98a)
Space heating requirement - total per year (kWh/year)												1687.3474	
Solar heating kWh	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	353.7374	256.3901	225.9792	128.0650	62.2683	0.0000	0.0000	0.0000	0.0000	118.4508	214.3941	328.0625	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1687.3474	
Space heating per m2											(98c) / (4) =	18.5504	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	269.9311	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	353.7374	256.3901	225.9792	128.0650	62.2683	0.0000	0.0000	0.0000	0.0000	118.4508	214.3941	328.0625	(98)
Space heating efficiency (main heating system 1)	269.9311	269.9311	269.9311	269.9311	269.9311	0.0000	0.0000	0.0000	0.0000	269.9311	269.9311	269.9311	(210)
Space heating fuel (main heating system)	131.0473	94.9835	83.7174	47.4436	23.0682	0.0000	0.0000	0.0000	0.0000	43.8819	79.4255	121.5357	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	261.4795	216.5376	186.5565	127.4673	92.8350	77.6451	77.0894	98.4317	129.2728	185.7672	230.5579	258.3985	(64)
Efficiency of water heater												281.3569	(216)
(217)m	281.3569	281.3569	281.3569	281.3569	281.3569	281.3569	281.3569	281.3569	281.3569	281.3569	281.3569	281.3569	(217)
Fuel for water heating, kWh/month	92.9352	76.9619	66.3060	45.3045	32.9955	27.5967	27.3991	34.9846	45.9462	66.0255	81.9450	91.8401	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	36.4509	32.9233	36.4509	35.2750	36.4509	35.2750	36.4509	36.4509	35.2750	36.4509	35.2750	36.4509	(231)
Lighting	30.8703	24.7653	22.2984	16.3368	12.6190	10.3098	11.5115	14.9631	19.4355	25.5005	28.8027	31.7283	(232)

Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-32.3344	-50.2115	-78.6710	-91.6951	-98.0812	-90.9873	-89.0335	-82.6503	-73.7830	-60.0829	-37.4203	-29.2209 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-10.0465	-24.0818	-54.7786	-90.1742	-121.6439	-129.1407	-123.8907	-100.5819	-74.5168	-38.6686	-14.7883	-8.7012 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year		
Space heating fuel - main system 1	625.1031	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	281.3569	
Water heating fuel used	690.2402	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.1900)		
mechanical ventilation fans (SFP = 1.1900)	349.1794	(230a)
pump for solar water heating	80.0000	(230g)
Total electricity for the above, kWh/year	429.1794	(231)
Electricity for lighting (calculated in Appendix L)	249.1413	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1605.1846	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	388.4794	(238)

10a. Fuel costs - using BEDF prices (583)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	625.1031	28.4300	177.7168	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	690.2402	28.4300	196.2353	(247)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(247a)
Pumps, fans and electric keep-hot	349.1794	28.4300	99.2717	(249)
Pump for solar water heating	80.0000	28.4300	22.7440	(249)
Energy for lighting	249.1413	28.4300	70.8309	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-814.1715	28.4300	-231.4690	
PV Unit electricity exported	-791.0131	5.8100	-45.9579	
Total			-277.4268	(252)
Total energy cost			289.3718	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	625.1031	0.1551	96.9678	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	690.2402	0.1458	100.6408	(264)
Space and water heating			197.6086	(265)
Pumps, fans and electric keep-hot	429.1794	0.1387	59.5325	(267)
Energy for lighting	249.1413	0.1443	35.9588	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-814.1715	0.1339	-109.0444	
PV Unit electricity exported	-791.0131	0.1236	-97.8071	
Total			-206.8515	(269)
Total CO2, kg/year			86.2483	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	625.1031	1.5743	984.0930	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	690.2402	1.5394	1062.5234	(278)
Space and water heating			2046.6164	(279)
Pumps, fans and electric keep-hot	429.1794	1.5128	649.2626	(281)
Energy for lighting	249.1413	1.5338	382.1413	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-814.1715	1.4950	-1217.1654	
PV Unit electricity exported	-791.0131	0.4538	-358.9670	
Total			-1576.1324	(283)
Total Primary energy kWh/year			1501.8879	(286)

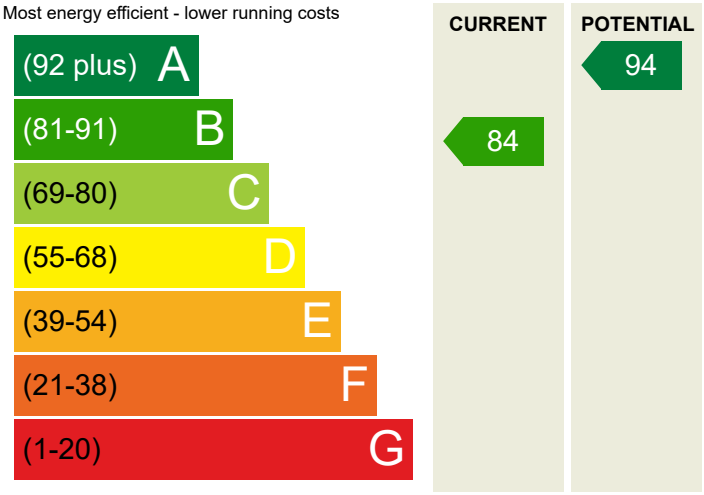
Energy Report

Dwelling Address	844 Rochdale Road, MANCHESTER, M9 8FA
Reference	78449-06-001
Assessment Date	02/07/2025
Submission Date	
Property Type	House, Mid-Terrace
Total Floor Area	91

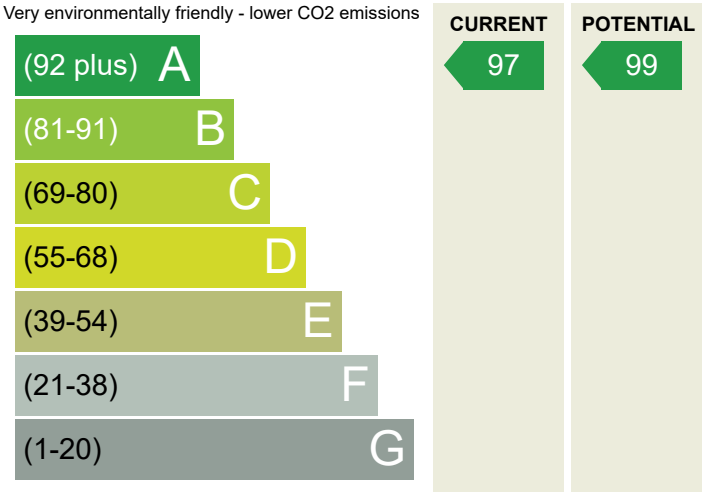
This Energy Report has been generated using the UK's National Calculation Methodology for dwellings, Standard Assessment Procedure (SAP). This methodology is used to assess the energy efficiency of dwellings which is calculated based on a dwelling's heating, hot water, ventilation and lighting usage.

This document is not an Energy Performance Certificate (EPC) as required by the Energy Performance of Buildings Regulations

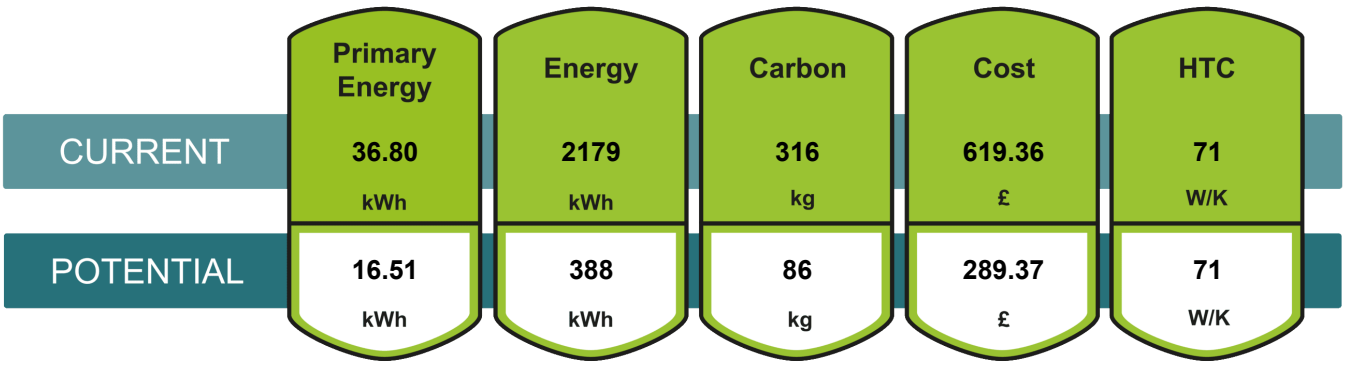
Energy Efficiency Rating



Carbon Dioxide (CO2) Emissions Rating



Additional ratings for your home



Energy Report

Breakdown of property's energy performance

Each feature is assessed as one of the following:

Very Poor | Poor | Average | Good | Very Good

Feature	Description	Energy Performance
Walls	Average thermal transmittance 0.13 W/m²K	Very Good
Roof	Average thermal transmittance 0.13 W/m²K	Very Good
Floor	Average thermal transmittance 0.1 W/m²K	Very Good
Windows	High performance glazing	Very Good
Main heating	Air source heat pump, radiators, electric	Good
Main heating controls	Programmer, room thermostat and TRVs	Good
Secondary heating	None	
Hot water	From main system	Good
Lighting	Good lighting efficiency	Good
Air tightness	Air permeability [AP50] = 5.0 m³/h.m² (as tested)	Good

Recommendations

The recommended measures provided below will help to improve the energy efficiency of the dwelling.
To reach the dwelling's potential energy rating all of the recommended measures shown below would need to be installed.
Having these measures installed individually or in any other order may give a different result when compared with the cumulative potential rating.

Recommended measures	Cumulative savings (per year)	Cumulative rating	Typical costs	Incremental savings (per year)	Cumulative CO2 rating
Solar water heating	£53	B 86	£4,000 - £7,000	£53	A 97
Photovoltaic	£330	A 94	£8,000 - £10,000	£277	A 99

Energy Report

The typical cost is based on average installation prices across the country so may not be representative of the actual costs in your area.

Estimated energy costs of the dwelling

The table below shows the estimated running costs of the space and water heating and lighting within the dwelling. It does not include the energy used from household appliances. The estimated annual costs after potential improvements indicates the total energy cost if all recommended measures named above were installed.

	Estimated annual costs	Estimated annual costs after potential improvements	Potential future savings
Lighting	£71	£71	
Heating	£274	£300	
Hot Water	£275	£196	
New Technologies e.g. Impact of PV	£0	-(£277)	
TOTAL	£619	£289	

Estimated energy use and potential savings

Space Heating
614
kWh per year

Water Heating
966
kWh per year

Energy Report

About this document

Created by:	
Company/Trading name:	
Phone number:	
Email address:	

Disclaimer

This Energy Report should not under any circumstances be treated as a Condition Survey and cannot be used to indicate that any element of the dwelling (e.g.heating system) is working correctly.
This Energy Report must not be used in situations where an Energy Performance Certificate (EPC) is required.
This Energy Report is generated from a set of data inputs which may not reflect the actual dimensions, services or construction of the dwelling.
The calculation used to generate this report reflects the SAP Methodology current at the time of report generation.

Glossary terms for additional metrics

Primary Energy	The measure of the energy required for lighting, heating and hot water in a property. This includes the efficiency of the property's heating system, power station efficiency for electricity and the energy used to produce the fuel and deliver it to the property.
Energy Used	The estimated amount of fuel energy for lighting, heating and hot water for the property. The estimate is based on typical usage which is likely to be different to actual consumption.
Carbon (CO2)	The current emissions based on the energy estimates.
Cost	The estimated cost of energy. The cost of each unit of fuel is based on an industry standard which is likely to be different to those the occupier actually pays.
Heat Transfer Coefficient	Heat flow through the property envelope where internal and external temperatures are different.

Building Regulations England Part L (BREL) Compliance Report

Approved Document L1 2021 Edition, England assessed by Array SAP 10 program, Array

Date: Fri 03 Oct 2025 15:03:27

Project Information			
Assessed By	Paul Goddard	Building Type	House, Mid-terrace
OCDEA Registration	EES/005113	Assessment Date	2025-10-03

Dwelling Details			
Assessment Type	As built	Total Floor Area	91 m^2
Site Reference	78449-07	Plot Reference	001
Address	842 Rochdale Road, MANCHESTER, M9 8FA		

Client Details	
Name	-
Company	John Southworth
Address	Unit 10, Charles Street, DUKINFIELD, SK16 4SD

This report covers items included within the SAP calculations. It is not a complete report of regulations compliance.

1a Target emission rate and dwelling emission rate		
Fuel for main heating system	Electricity	
Target carbon dioxide emission rate	*11.44 $kgCO_2/m^2$*	
Dwelling carbon dioxide emission rate	3.62 $kgCO_2/m^2$	**OK**
1b Target primary energy rate and dwelling primary energy		
Target primary energy	*59.93 kWh_{PE}/m^2*	
Dwelling primary energy	38.33 kWh_{PE}/m^2	**OK**
1c Target fabric energy efficiency and dwelling fabric energy efficiency		
Target fabric energy efficiency	*36.9 kWh/m^2*	
Dwelling fabric energy efficiency	34.1 kWh/m^2	**OK**

2a Fabric U-values				
Element	***Maximum permitted average U-Value [W/m^2K]***	**Dwelling average U-Value [W/m^2K]**	**Element with highest individual U-Value**	
External walls	*0.26*	0.13	Walls (1) (0.13)	**OK**
Party walls	*0.2*	0	Party Wall (1) (0)	**N/A**
Curtain walls	*1.6*	0	N/A	**N/A**
Floors	*0.18*	0.09	Exposed Floor (0.14)	**OK**
Roofs	*0.16*	0.13	Roof (1) (0.13)	**OK**
Windows, doors, and roof windows	*1.6*	0.87	Front (1)	**OK**
Rooflights	*2.2*	N/A	N/A	**N/A**

2b Envelope elements (better than typically expected values are flagged with a subsequent (!))		
Name	**Net area [m^2]**	**U-Value [W/m^2K]**
Exposed wall: Walls (1)	52.2	0.13 **(!)**
Party wall: Party Wall (1)	88.21	0 **(!)**
Ground floor: GF, GF	41.18	0.08 **(!)**
Upper floor: Exposed Floor, Exposed Floor	8.6	0.14
Exposed roof: Roof (1)	49.779998779296875	0.13

2c Openings (better than typically expected values are flagged with a subsequent (!))				
Name	**Area [m^2]**	**Orientation**	**Frame factor**	**U-Value [W/m^2K]**
Front, Door	1.99	East	N/A	1 **(!)**
Front, Window	4.98	East	1.0	0.8 **(!)**
Rear, Window	3.53	West	1.0	0.8 **(!)**
Rear, Door	2.15	West	N/A	1 **(!)**

2d Thermal bridging (better than typically expected values are flagged with a subsequent (!))				
Building part **1**: Thermal bridging calculated from linear thermal transmittances for each junction				
Main element	**Junction detail**	**Source**	**Psi value [W/mK]**	**Drawing / reference**
External wall	E2: Other lintels (including other steel lintels)	Calculated by person with suitable expertise	0.115	Thermal Bridge Report

Main element	Junction detail	Source	Psi value [W/mK]	Drawing / reference
External wall	E3: Sill	Calculated by person with suitable expertise	0.017 **(!)**	Thermal Bridge Report
External wall	E4: Jamb	Calculated by person with suitable expertise	0.094	Thermal Bridge Report
External wall	E5: Ground floor (normal)	Calculated by person with suitable expertise	0.067	Thermal Bridge Report
External wall	E16: Corner (normal)	Calculated by person with suitable expertise	0.068	Thermal Bridge Report
External wall	E12: Gable (insulation at ceiling level)	Calculated by person with suitable expertise	0.077	Thermal Bridge Report
External wall	E6: Intermediate floor within a dwelling	Calculated by person with suitable expertise	0.032 **(!)**	Thermal Bridge Report
External wall	E17: Corner (inverted - internal area greater than external area)	Calculated by person with suitable expertise	-0.029 **(!)**	Thermal Bridge Report
Party wall	P1: Ground floor	SAP table default	0.32	K1
External wall	E20: Exposed floor (normal)	Calculated by person with suitable expertise	0.079	Thermal Bridge Report
External wall	E21: Exposed floor (inverted)	Calculated by person with suitable expertise	0.063	Thermal Bridge Report
External wall	E18: Party wall between dwellings	Calculated by person with suitable expertise	0.092	Thermal Bridge Report
Party wall	P4: Roof (insulation at ceiling level)	Calculated by person with suitable expertise	0.102	Thermal Bridge Report

3 Air permeability (better than typically expected values are flagged with a subsequent (!))		
Maximum permitted air permeability at 50Pa	*8 m^3/hm^2*	
Dwelling air permeability at 50Pa	5 m^3/hm^2, Measured value	**OK**
Air permeability test certificate reference		

4 Space heating	
Main heating system 1: Heat pump with radiators or underfloor heating - Electricity	
Efficiency	270.7%
Emitter type	Radiators
Flow temperature	45°C
System type	
Manufacturer	Daikin Europe NV
Model	EDLA09DA3V3
Commissioning	
Secondary heating system: N/A	
Fuel	N/A
Efficiency	N/A
Commissioning	

5 Hot water	
Cylinder/store - type: Cylinder	
Capacity	210 litres
Declared heat loss	1.58 kWh/day
Primary pipework insulated	Yes
Manufacturer	
Model	
Commissioning	
Waste water heat recovery system 1 - type: N/A	
Efficiency	
Manufacturer	
Model	

6 Controls	
Main heating 1 - type: Programmer, room thermostat and TRVs	
Function	
Ecodesign class	
Manufacturer	
Model	

Water heating - type: Cylinder thermostat and HW separately timed	
Manufacturer	
Model	

7 Lighting		
Minimum permitted light source efficacy	*75 lm/W*	
Lowest light source efficacy	80 lm/W	OK
External lights control	N/A	

8 Mechanical ventilation		
System type: Balanced whole-house mechanical ventilation with heat recovery		
Maximum permitted specific fan power	*1.5 W/(l/s)*	
Specific fan power	0.85 W/(l/s)	OK
Minimum permitted heat recovery efficiency	*73%*	
Heat recovery efficiency	90%	OK
Manufacturer/Model	DV110 Adroit	
Commissioning		

9 Local generation
N/A

10 Heat networks
N/A

11 Supporting documentary evidence	
Documentary evidence identified in 11.1 and 11.2 is needed to confirm the data values used for any calculations undertaken, manufacturer declarations made, and tests performed as reflected in this "As built" BREL Compliance Report are correct. 11.1 SAP Conventions, Appendix 1 (documentary evidence) schedules the minimum documentary evidence required. 11.2 Indicative photographic evidence of key stages during construction (guidance within Approved Document L, Volume 1 – Appendix B) that confirms the products identified in this BREL Compliance Report are used in this dwelling, and workmanship is of sufficient quality to support the calculated values claimed in 2a to 2d.	

12 Declarations	
a. Assessor Declaration	
This declaration by the assessor is confirmation that the contents of this BREL Compliance Report are a true and accurate reflection based upon the design and construction information submitted for this dwelling for the purpose of carrying out the assessment, and that the supporting documentary evidence (identified in 11.1 and 11.2) pursuant to Part L of the Building Regulations 2010 (as amended) has been reviewed in the course of preparing this BREL Compliance Report.	
Signed: Name:	Assessor ID: Date:
b. Client Declaration	
This declaration by the client is confirmation that the dwelling has been constructed and completed according to the specifications set out in this BREL Compliance Report, and that photographic evidence of key stages, as described in 11.2, has been provided to the Assessor for this dwelling.	
Signed: Name:	Organisation: Date:

Full SAP Calculation Printout

Property Reference	78449-07	**Issued on Date**	03/10/2025
Assessment Reference	001	**Prop Type Ref**	Mid
Property	842 Rochdale Road, MANCHESTER, M9 8FA		

SAP Rating	84 B	**DER**	3.62	**TER**	11.44
Environmental	97 A	**% DER < TER**			68.36
CO_2 Emissions (t/year)	0.32	**DFEE**	34.10	**TFEE**	36.90
Compliance Check	See BREL	**% DFEE < TFEE**			7.58
% DPER < TPER	36.04	**DPER**	38.33	**TPER**	59.93

Assessor Details	Mr. Daniel Goddard	**Assessor ID**	CP52-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	41.1800 (1b)	x	2.4800 (2b)	=	102.1264	(1b) - (3b)
First floor	49.7800 (1c)	x	2.7800 (2c)	=	138.3884	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	90.9600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	240.5148	(5)

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2. Ventilation rate

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			m3 per hour
Number of open chimneys		0 * 80 =	0.0000 (6a)
Number of open flues		0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000 (6d)
Number of flues attached to other heater		0 * 35 =	0.0000 (6e)
Number of blocked chimneys		0 * 20 =	0.0000 (6f)
Number of intermittent extract fans		0 * 10 =	0.0000 (7a)
Number of passive vents		0 * 10 =	0.0000 (7b)
Number of flueless gas fires		0 * 40 =	0.0000 (7c)
			Air changes per hour
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		0.0000 / (5) =	0.0000 (8)
Pressure test			Yes
Pressure Test Method			Blower Door
Measured/design AP50			5.0000 (17)
Infiltration rate			0.2500 (18)
Number of sides sheltered			2 (19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.2125 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2709	0.2656	0.2603	0.2338	0.2284	0.2019	0.2019	0.1966	0.2125	0.2284	0.2391	0.2497	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =		81.0000 (23c)

Effective ac	0.3659	0.3606	0.3553	0.3287	0.3234	0.2969	0.2969	0.2916	0.3075	0.3234	0.3341	0.3447	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door			4.1400	1.0000	4.1400			(26)
Window			8.5100	0.7752	6.5969			(27)
GF			41.1800	0.0800	3.2944	75.0000	3088.5000	(28a)
Exposed Floor			8.6000	0.1400	1.2040	20.0000	172.0000	(28b)
Main	64.8536	12.6500	52.2036	0.1300	6.7865	9.0000	469.8324	(29a)
PIJ	49.7800		49.7800	0.1300	6.4714	9.0000	448.0200	(30)
Total net area of external elements Aum(A, m2)			164.4136					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		28.4932			(33)
Main dwelling								
Party Wall 1			88.2100	0.0000	0.0000	20.0000	1764.2000	(32)
Timber			96.4800			9.0000	868.3200	(32c)
FF			41.1800			18.0000	741.2400	(32d)
GF			41.1800			9.0000	370.6200	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 7922.7324 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 87.1013 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	8.6300	0.1150	0.9925
E3 Sill	8.6300	0.0170	0.1467
E4 Jamb	28.2000	0.0940	2.6508
E5 Ground floor (normal)	13.8200	0.0670	0.9259
E16 Corner (normal)	4.9600	0.0680	0.3373
E12 Gable (insulation at ceiling level)	11.0000	0.0770	0.8470
E6 Intermediate floor within a dwelling	11.0000	0.0320	0.3520
E17 Corner (inverted - internal area greater than external area)	4.9600	-0.0290	-0.1438
P1 Party wall - Ground floor	15.2800	0.3200	4.8896
E20 Exposed floor (normal)	6.4400	0.0790	0.5088
E21 Exposed floor (inverted)	12.0800	0.0630	0.7610
E18 Party wall between dwellings	21.0400	0.0920	1.9357
P4 Party wall - Roof (insulation at ceiling level)	18.1000	0.1020	1.8462

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 16.0496 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 44.5428 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	29.0444	28.6228	28.2011	26.0928	25.6712	23.5629	23.5629	23.1413	24.4062	25.6712	26.5145	27.3578	(38)
Heat transfer coeff	73.5872	73.1656	72.7439	70.6356	70.2140	68.1057	68.1057	67.6841	68.9490	70.2140	71.0573	71.9006	(39)
Average = Sum(39)m / 12 =												70.5302	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8090	0.8044	0.7997	0.7766	0.7719	0.7487	0.7487	0.7441	0.7580	0.7719	0.7812	0.7905	(40)
HLP (average)												0.7754	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6386 (42)
Hot water usage for mixer showers

68.4610	67.4321	65.9329	63.0644	60.9476	58.5869	57.2450	58.7329	60.3639	62.8986	65.8287	68.1987	(42a)

Hot water usage for baths

29.5637	29.1246	28.5063	27.3663	26.5127	25.5661	25.0549	25.6688	26.3373	27.3502	28.5137	29.4637	(42b)

Hot water usage for other uses

41.6522	40.1376	38.6230	37.1084	35.5937	34.0791	34.0791	35.5937	37.1084	38.6230	40.1376	41.6522	(42c)

Average daily hot water use (litres/day) 128.3946 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	139.6769	136.6944	133.0622	127.5391	123.0540	118.2321	116.3790	119.9955	123.8096	128.8717	134.4799	139.3147	(44)
Energy conte	221.2141	194.6510	204.5117	174.5947	165.6543	145.3802	140.7503	148.5795	152.6696	174.8777	191.5913	218.1331	(45)
Energy content (annual)										Total = Sum(45)m =		2132.6075	

Distribution loss (46)m = 0.15 x (45)m

33.1821	29.1976	30.6768	26.1892	24.8482	21.8070	21.1126	22.2869	22.9004	26.2317	28.7387	32.7200	(46)

Water storage loss:
Store volume 210.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.5800 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.8532 (55)
Total storage loss

26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(56)

If cylinder contains dedicated solar storage

26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(57)
23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Primary loss
Combi loss
Total heat required for water heating calculated for each month

270.9257	239.5518	254.2233	222.7027	215.3659	193.4882	190.4619	198.2911	200.7776	224.5893	239.6993	267.8447	(62)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

WWHRS
PV diverter
Solar input
FGHRS
Output from w/h

270.9257	239.5518	254.2233	222.7027	215.3659	193.4882	190.4619	198.2911	200.7776	224.5893	239.6993	267.8447	(64)

Total per year (kWh/year) = Sum(64)m = 2717.9215 (64)
12Total per year (kWh/year) 2718 (64)
Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)
Heat gains from water heating, kWh/month

113.3230	100.6421	107.7694	96.5391	94.8493	86.8253	86.5688	89.1720	89.2490	97.9161	102.1905	112.2985	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	145.9975	161.6401	145.9975	150.8641	145.9975	150.8641	145.9975	145.9975	150.8641	145.9975	150.8641	145.9975	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	240.8328	243.3319	237.0343	223.6274	206.7036	190.7976	180.1714	177.6723	183.9699	197.3768	214.3007	230.2066	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	(71)
Water heating gains (Table 5)	152.3158	149.7650	144.8514	134.0821	127.4857	120.5907	116.3559	119.8548	123.9570	131.6077	141.9313	150.9389	(72)
Total internal gains	601.7256	617.3165	590.4626	571.1531	542.7662	524.8319	505.1042	506.1041	521.3705	537.5615	569.6755	589.7225	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a	g Specific data	FF Specific data	Access factor	Gains W

					W/m2	or Table 6b		or Table 6c		Table 6d			
East					4.9800	19.6403		0.3000	0.0000	0.7700		22.5938	(76)
West					3.5300	19.6403		0.3000	0.0000	0.7700		16.0153	(80)
Solar gains	38.6090	75.5274	124.3829	181.4051	222.3188	227.5828	216.6681	186.1147	144.6625	89.6197	48.1409	31.7502	(83)
Total gains	640.3346	692.8439	714.8456	752.5582	765.0850	752.4147	721.7724	692.2188	666.0330	627.1812	617.8164	621.4727	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	29.9068	30.0792	30.2535	31.1565	31.3436	32.3139	32.3139	32.5152	31.9186	31.3436	30.9716	30.6084	
alpha	2.9938	3.0053	3.0169	3.0771	3.0896	3.1543	3.1543	3.1677	3.1279	3.0896	3.0648	3.0406	
util living area	0.9265	0.9051	0.8739	0.8005	0.6927	0.5307	0.3996	0.4294	0.6194	0.8096	0.8956	0.9309	(86)
Living	19.2282	19.4614	19.7964	20.2867	20.6516	20.8954	20.9678	20.9595	20.8198	20.3698	19.7744	19.2315	
Non living	18.6144	18.8450	19.1745	19.6594	20.0000	20.2268	20.2808	20.2795	20.1607	19.7473	19.1690	18.6294	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.0936	19.4614	19.7964	20.2867	20.6516	20.8954	20.9678	20.9595	20.8198	20.3698	19.7744	19.4788	(87)
Th 2	20.2455	20.2495	20.2536	20.2737	20.2777	20.2980	20.2980	20.3020	20.2899	20.2777	20.2697	20.2616	(88)
util rest of house	0.9187	0.8951	0.8602	0.7788	0.6590	0.4827	0.3406	0.3702	0.5727	0.7849	0.8832	0.9236	(89)
MIT 2	19.4111	18.8450	19.1745	19.6594	20.0000	20.2268	20.2808	20.2795	20.1607	19.7473	19.1690	18.8577	(90)
Living area fraction										fLA = Living area / (4) =		0.3196	(91)
MIT	19.6292	19.0420	19.3732	19.8599	20.2082	20.4405	20.5004	20.4968	20.3713	19.9462	19.3625	19.0562	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6292	19.0420	19.3732	19.8599	20.2082	20.4405	20.5004	20.4968	20.3713	19.9462	19.3625	19.0562	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9114	0.8762	0.8417	0.7653	0.6556	0.4927	0.3579	0.3870	0.5783	0.7723	0.8653	0.9093	(94)
Useful gains	583.6055	607.0518	601.6955	575.9327	501.6028	370.7506	258.3504	267.9168	385.1931	484.3734	534.5741	565.0785	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1128.0364	1034.7055	936.4503	774.1591	597.3978	397.7702	265.6377	277.2882	432.4032	656.2346	871.3380	1068.1696	(97)
Space heating kWh	405.0565	287.3833	249.0575	142.7230	71.2714	0.0000	0.0000	0.0000	0.0000	127.8647	242.4700	374.2997	(98a)
Space heating requirement - total per year (kWh/year)												1900.1263	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	405.0565	287.3833	249.0575	142.7230	71.2714	0.0000	0.0000	0.0000	0.0000	127.8647	242.4700	374.2997	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1900.1263	
Space heating per m2											(98c) / (4) =	20.8897	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												270.7081	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	405.0565	287.3833	249.0575	142.7230	71.2714	0.0000	0.0000	0.0000	0.0000	127.8647	242.4700	374.2997	(98)
Space heating efficiency (main heating system 1)	270.7081	270.7081	270.7081	270.7081	270.7081	0.0000	0.0000	0.0000	0.0000	270.7081	270.7081	270.7081	(210)
Space heating fuel (main heating system)	149.6285	106.1598	92.0022	52.7221	26.3278	0.0000	0.0000	0.0000	0.0000	47.2334	89.5688	138.2669	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	270.9257	239.5518	254.2233	222.7027	215.3659	193.4882	190.4619	198.2911	200.7776	224.5893	239.6993	267.8447	(64)
Efficiency of water heater												281.1060	(216)
(217)m	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	(217)
Fuel for water heating, kWh/month	96.3785	85.2176	90.4368	79.2237	76.6138	68.8310	67.7545	70.5396	71.4242	79.8949	85.2701	95.2824	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	29.6563	26.7864	29.6563	28.6997	29.6563	28.6997	29.6563	29.6563	28.6997	29.6563	28.6997	29.6563	(231)
Lighting	30.8703	24.7653	22.2984	16.3368	12.6190	10.3098	11.5115	14.9631	19.4355	25.5005	28.8027	31.7283	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	701.9096	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	281.1060	
Water heating fuel used	966.8671	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.1900)		
mechanical ventilation fans (SFP = 1.1900)	349.1794	(230a)
Total electricity for the above, kWh/year	349.1794	(231)
Electricity for lighting (calculated in Appendix L)	249.1413	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2267.0974	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	701.9096	0.1552	108.9520	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	966.8671	0.1410	136.2905	(264)
Space and water heating			245.2426	(265)
Pumps, fans and electric keep-hot	349.1794	0.1387	48.4355	(267)
Energy for lighting	249.1413	0.1443	35.9588	(268)
Total CO2, kg/year			329.6368	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.6200	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	701.9096	1.5746	1105.2587	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	966.8671	1.5212	1470.8230	(278)
Space and water heating			2576.0817	(279)
Pumps, fans and electric keep-hot	349.1794	1.5128	528.2386	(281)
Energy for lighting	249.1413	1.5338	382.1413	(282)
Total Primary energy kWh/year			3486.4616	(286)
Dwelling Primary energy Rate (DPER)			38.3300	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	41.1800	(1b)	x 2.4800	(2b) =	102.1264	(1b) - (3b)
First floor	49.7800	(1c)	x 2.7800	(2c) =	138.3884	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	90.9600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		240.5148	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1247	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3747	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3185	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)

Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4061	0.3982	0.3902	0.3504	0.3424	0.3026	0.3026	0.2946	0.3185	0.3424	0.3583	0.3743 (22b)
Effective ac	0.5825	0.5793	0.5761	0.5614	0.5586	0.5458	0.5458	0.5434	0.5507	0.5586	0.5642	0.5700 (25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			4.1400	1.0000	4.1400			(26)
TER Opening Type			8.5100	1.1450	9.7443			(27)
GF			41.1800	0.1300	5.3534			(28a)
Exposed Floor			8.6000	0.1300	1.1180			(28b)
Main	64.8536	12.6500	52.2036	0.1800	9.3966			(29a)
PIJ	49.7800		49.7800	0.1100	5.4758			(30)
Total net area of external elements Aum(A, m2)			164.4136					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	35.2281			(33)
Main dwelling								
Party Wall 1			88.2100	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	87.1013	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	8.6300	0.0500	0.4315
E3 Sill	8.6300	0.0500	0.4315
E4 Jamb	28.2000	0.0500	1.4100
E5 Ground floor (normal)	13.8200	0.1600	2.2112
E16 Corner (normal)	4.9600	0.0900	0.4464
E12 Gable (insulation at ceiling level)	11.0000	0.0600	0.6600
E6 Intermediate floor within a dwelling	11.0000	0.0000	0.0000
E17 Corner (inverted - internal area greater than external area)	4.9600	-0.0900	-0.4464
P1 Party wall - Ground floor	15.2800	0.0800	1.2224
E20 Exposed floor (normal)	6.4400	0.3200	2.0608
E21 Exposed floor (inverted)	12.0800	0.3200	3.8656
E18 Party wall between dwellings	21.0400	0.0600	1.2624
P4 Party wall - Roof (insulation at ceiling level)	18.1000	0.1200	2.1720

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		15.7274	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	50.9555	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	46.2302	45.9760	45.7269	44.5568	44.3378	43.3187	43.3187	43.1299	43.7112	44.3378	44.7807	45.2438	(38)
Heat transfer coeff	97.1857	96.9316	96.6824	95.5123	95.2934	94.2742	94.2742	94.0855	94.6668	95.2934	95.7363	96.1993	(39)
Average = Sum(39)m / 12 =												95.5112	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0684	1.0657	1.0629	1.0500	1.0476	1.0364	1.0364	1.0344	1.0408	1.0476	1.0525	1.0576	(40)
HLP (average)												1.0500	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy											2.6386	(42)
Hot water usage for mixer showers	68.4610	67.4321	65.9329	63.0644	60.9476	58.5869	57.2450	58.7329	60.3639	62.8986	65.8287	68.1987 (42a)
Hot water usage for baths	29.5637	29.1246	28.5063	27.3663	26.5127	25.5661	25.0549	25.6688	26.3373	27.3502	28.5137	29.4637 (42b)
Hot water usage for other uses	41.6522	40.1376	38.6230	37.1084	35.5937	34.0791	34.0791	35.5937	37.1084	38.6230	40.1376	41.6522 (42c)
Average daily hot water use (litres/day)												128.3946 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	139.6769	136.6944	133.0622	127.5391	123.0540	118.2321	116.3790	119.9955	123.8096	128.8717	134.4799	139.3147	(44)
Energy conte	221.2141	194.6510	204.5117	174.5947	165.6543	145.3802	140.7503	148.5795	152.6696	174.8777	191.5913	218.1331	(45)
Energy content (annual)										Total = Sum(45)m =		2132.6075	
Distribution loss (46)m = 0.15 x (45)m	33.1821	29.1976	30.6768	26.1892	24.8482	21.8070	21.1126	22.2869	22.9004	26.2317	28.7387	32.7200	(46)
Water storage loss:													
Store volume												210.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7016	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.9188	(55)
Total storage loss	28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842	(56)
If cylinder contains dedicated solar storage	28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	272.9607	241.3898	256.2583	224.6720	217.4009	195.4575	192.4969	200.3261	202.7469	226.6243	241.6687	269.8797	(62)
WWHRS	-31.2975	-27.6798	-28.9847	-24.0004	-22.3675	-19.1401	-17.9408	-19.0782	-19.8031	-23.3456	-26.4477	-30.7179	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	241.6632	213.7101	227.2737	200.6716	195.0334	176.3175	174.5562	181.2479	182.9439	203.2787	215.2209	239.1618	(64)
										Total per year (kWh/year) = Sum(64)m =		2451.0786	(64)
12Total per year (kWh/year)												2451	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	114.9510	102.1125	109.3974	98.1146	96.4773	88.4008	88.1968	90.7999	90.8245	99.5441	103.7660	113.9265	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

(66)m	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	142.2156	157.4530	142.2156	146.9561	142.2156	146.9561	142.2156	142.2156	146.9561	142.2156	146.9561	142.2156	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	240.8328	243.3319	237.0343	223.6274	206.7036	190.7976	180.1714	177.6723	183.9699	197.3768	214.3007	230.2066	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	(71)
Water heating gains (Table 5)													
	154.5040	151.9532	147.0395	136.2703	129.6738	122.7789	118.5440	122.0429	126.1452	133.7959	144.1194	153.1270	(72)
Total internal gains													
	603.1319	618.3176	591.8689	572.4333	544.1725	523.1121	503.5105	504.5103	519.6507	538.9678	570.9557	591.1288	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	4.9800	19.6403	0.6300	0.7000	0.7700	29.8916	(76)
West	3.5300	19.6403	0.6300	0.7000	0.7700	21.1882	(80)

Solar gains	51.0797	99.9228	164.5586	239.9990	294.1277	301.0921	286.6519	246.2298	191.3885	118.5668	63.6904	42.0055	(83)
Total gains	654.2116	718.2404	756.4276	812.4323	838.3003	824.2042	790.1625	750.7401	711.0392	657.5346	634.6461	633.1343	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	22.6449	22.7043	22.7628	23.0416	23.0946	23.3442	23.3442	23.3911	23.2474	23.0946	22.9877	22.8771	
alpha	2.5097	2.5136	2.5175	2.5361	2.5396	2.5563	2.5563	2.5594	2.5498	2.5396	2.5325	2.5251	
util living area													
	0.9363	0.9179	0.8900	0.8294	0.7371	0.6002	0.4715	0.5071	0.6872	0.8450	0.9135	0.9408	(86)
MIT	18.4665	18.7376	19.1692	19.7832	20.3219	20.7241	20.8928	20.8676	20.5829	19.8994	19.1053	18.4305	(87)
Th 2	20.0267	20.0290	20.0312	20.0418	20.0438	20.0531	20.0531	20.0548	20.0495	20.0438	20.0398	20.0356	(88)
util rest of house													
	0.9284	0.9077	0.8757	0.8060	0.6983	0.5374	0.3858	0.4222	0.6306	0.8190	0.9010	0.9333	(89)
MIT 2	17.0633	17.4054	17.9489	18.7154	19.3635	19.8213	19.9856	19.9670	19.6760	18.8716	17.8806	17.0230	(90)
Living area fraction										fLA = Living area / (4) =		0.3196	(91)
MIT	17.5118	17.8312	18.3389	19.0566	19.6698	20.1098	20.2755	20.2548	19.9659	19.2001	18.2720	17.4728	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.5118	17.8312	18.3389	19.0566	19.6698	20.1098	20.2755	20.2548	19.9659	19.2001	18.2720	17.4728	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9004	0.8773	0.8442	0.7775	0.6812	0.5414	0.4069	0.4412	0.6251	0.7913	0.8712	0.9063	(94)
Useful gains	589.0216	630.1383	638.5494	631.6864	571.0784	446.2550	321.5222	331.1952	444.4610	520.3070	552.8988	573.8331	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1283.9967	1253.4418	1144.6149	970.0843	759.4665	519.4329	346.5070	362.6828	555.3014	819.5308	1069.5680	1276.8325	(97)
Space heating kWh													
	517.0614	418.8600	376.5127	243.6465	140.1607	0.0000	0.0000	0.0000	0.0000	222.6225	372.0018	523.0315	(98a)
Space heating requirement - total per year (kWh/year)												2813.8972	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	517.0614	418.8600	376.5127	243.6465	140.1607	0.0000	0.0000	0.0000	0.0000	222.6225	372.0018	523.0315	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2813.8972	
Space heating per m2											(98c) / (4) =	30.9355	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	517.0614	418.8600	376.5127	243.6465	140.1607	0.0000	0.0000	0.0000	0.0000	222.6225	372.0018	523.0315	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	560.1966	453.8028	407.9227	263.9724	151.8534	0.0000	0.0000	0.0000	0.0000	241.1945	403.0355	566.6647	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	241.6632	213.7101	227.2737	200.6716	195.0334	176.3175	174.5562	181.2479	182.9439	203.2787	215.2209	239.1618	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.7207	85.5407	85.1837	84.4960	83.3316	79.8000	79.8000	79.8000	79.8000	84.2641	85.2751	85.7649	(217)
Fuel for water heating, kWh/month													
	281.9193	249.8345	266.8041	237.4923	234.0450	220.9492	218.7421	227.1276	229.2530	241.2400	252.3842	278.8574	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)

Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	29.5496	23.7058	21.3444	15.6378	12.0791	9.8687	11.0190	14.3229	18.6040	24.4095	27.5704	30.3709	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-38.9812	-55.1702	-79.5760	-89.7571	-96.9883	-90.5718	-89.4598	-84.3870	-75.4216	-63.2498	-42.9366	-33.6769	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-21.3144	-44.9402	-89.5251	-134.7575	-178.4789	-179.4591	-177.3409	-150.0006	-109.7478	-64.3537	-28.4842	-16.8460	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	3048.6426	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2938.6486	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	238.4821	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-2035.4247	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	4276.3487	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3048.6426	0.2100	640.2150	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2938.6486	0.2100	617.1162	(264)
Space and water heating			1257.3312	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	238.4821	0.1443	34.4203	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-840.1762	0.1345	-113.0202	
PV Unit electricity exported	-1195.2485	0.1258	-150.3985	
Total			-263.4187	(269)
Total CO2, kg/year			1040.2621	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.4400	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	3048.6426	1.1300	3444.9662	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2938.6486	1.1300	3320.6730	(278)
Space and water heating			6765.6391	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	238.4821	1.5338	365.7919	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-840.1762	1.4972	-1257.8767	
PV Unit electricity exported	-1195.2485	0.4619	-552.0620	
Total			-1809.9387	(283)
Total Primary energy kWh/year			5451.5931	(286)
Target Primary Energy Rate (TPER)			59.9300	(287)

Full SAP Calculation Printout

Property Reference	78449-07	**Issued on Date**	03/10/2025
Assessment Reference	001	**Prop Type Ref**	Mid
Property	842 Rochdale Road, MANCHESTER, M9 8FA		

SAP Rating	84 B	**DER**	3.62	**TER**	11.44
Environmental	97 A	**% DER < TER**			68.36
CO_2 Emissions (t/year)	0.32	**DFEE**	34.10	**TFEE**	36.90
Compliance Check	See BREL	**% DFEE < TFEE**			7.58
% DPER < TPER	36.04	**DPER**	38.33	**TPER**	59.93

Assessor Details	Mr. Daniel Goddard	**Assessor ID**	CP52-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	41.1800 (1b)	x	2.4800 (2b)	=	102.1264	(1b) - (3b)
First floor	49.7800 (1c)	x	2.7800 (2c)	=	138.3884	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	90.9600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	240.5148	(5)

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2. Ventilation rate

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			m3 per hour	
Number of open chimneys		0 * 80 =	0.0000	(6a)
Number of open flues		0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000	(6d)
Number of flues attached to other heater		0 * 35 =	0.0000	(6e)
Number of blocked chimneys		0 * 20 =	0.0000	(6f)
Number of intermittent extract fans		3 * 10 =	30.0000	(7a)
Number of passive vents		0 * 10 =	0.0000	(7b)
Number of flueless gas fires		0 * 40 =	0.0000	(7c)
			Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		30.0000 / (5) =	0.1247	(8)
Pressure test			Yes	
Pressure Test Method			Blower Door	
Measured/design AP50			5.0000	(17)
Infiltration rate			0.3747	(18)
Number of sides sheltered			2	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.3185	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4061	0.3982	0.3902	0.3504	0.3424	0.3026	0.3026	0.2946	0.3185	0.3424	0.3583	0.3743	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5825	0.5793	0.5761	0.5614	0.5586	0.5458	0.5458	0.5434	0.5507	0.5586	0.5642	0.5700	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door			4.1400	1.0000	4.1400			(26)
Window			8.5100	0.7752	6.5969			(27)
GF			41.1800	0.0800	3.2944	75.0000	3088.5000	(28a)
Exposed Floor			8.6000	0.1400	1.2040	20.0000	172.0000	(28b)
Main	64.8536	12.6500	52.2036	0.1300	6.7865	9.0000	469.8324	(29a)
PIJ	49.7800		49.7800	0.1300	6.4714	9.0000	448.0200	(30)
Total net area of external elements Aum(A, m2)			164.4136					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	28.4932			(33)
Main dwelling								
Party Wall 1			88.2100	0.0000	0.0000	20.0000	1764.2000	(32)
Timber			96.4800			9.0000	868.3200	(32c)
FF			41.1800			18.0000	741.2400	(32d)
GF			41.1800			9.0000	370.6200	(32e)
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =			7922.7324	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							87.1013	(35)
List of Thermal Bridges								

	Length	Psi-value	Total	
K1 Element				
E2 Other lintels (including other steel lintels)	8.6300	0.1150	0.9925	
E3 Sill	8.6300	0.0170	0.1467	
E4 Jamb	28.2000	0.0940	2.6508	
E5 Ground floor (normal)	13.8200	0.0670	0.9259	
E16 Corner (normal)	4.9600	0.0680	0.3373	
E12 Gable (insulation at ceiling level)	11.0000	0.0770	0.8470	
E6 Intermediate floor within a dwelling	11.0000	0.0320	0.3520	
E17 Corner (inverted - internal area greater than external area)	4.9600	-0.0290	-0.1438	
P1 Party wall - Ground floor	15.2800	0.3200	4.8896	
E20 Exposed floor (normal)	6.4400	0.0790	0.5088	
E21 Exposed floor (inverted)	12.0800	0.0630	0.7610	
E18 Party wall between dwellings	21.0400	0.0920	1.9357	
P4 Party wall - Roof (insulation at ceiling level)	18.1000	0.1020	1.8462	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			16.0496	(36)
Point Thermal bridges		(36a) =	0.0000	
Total fabric heat loss		(33) + (36) + (36a) =	44.5428	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	46.2302	45.9760	45.7269	44.5568	44.3378	43.3187	43.3187	43.1299	43.7112	44.3378	44.7807	45.2438	(38)
Heat transfer coeff	90.7730	90.5188	90.2697	89.0996	88.8806	87.8615	87.8615	87.6727	88.2540	88.8806	89.3235	89.7865	(39)
Average = Sum(39)m / 12 =												89.0985	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9979	0.9951	0.9924	0.9795	0.9771	0.9659	0.9659	0.9639	0.9703	0.9771	0.9820	0.9871	(40)
HLP (average)												0.9795	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy											2.6386	(42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	29.5637	29.1246	28.5063	27.3663	26.5127	25.5661	25.0549	25.6688	26.3373	27.3502	28.5137	29.4637	(42b)
Hot water usage for other uses	41.6522	40.1376	38.6230	37.1084	35.5937	34.0791	34.0791	35.5937	37.1084	38.6230	40.1376	41.6522	(42c)
Average daily hot water use (litres/day)												65.2759	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	71.2159	69.2622	67.1293	64.4747	62.1064	59.6452	59.1340	61.2626	63.4457	65.9732	68.6513	71.1160	(44)
Energy conte	112.7886	98.6285	103.1753	88.2626	83.6072	73.3408	71.5174	75.8559	78.2349	89.5249	97.8063	111.3504	(45)
Energy content (annual)										Total = Sum(45)m =		1084.0928	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	95.8703	83.8342	87.6990	75.0232	71.0661	62.3397	60.7898	64.4775	66.4996	76.0962	83.1354	94.6479	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	95.8703	83.8342	87.6990	75.0232	71.0661	62.3397	60.7898	64.4775	66.4996	76.0962	83.1354	94.6479	(64)
									Total per year (kWh/year) = Sum(64)m =			921.4789	(64)
12Total per year (kWh/year)												921	(64)
Electric shower(s)	54.8258	48.8503	53.3426	50.9042	51.8594	49.4688	51.1178	51.8594	50.9042	53.3426	52.3396	54.8258	(64a)
					Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =							623.6406	(64a)
Heat gains from water heating, kWh/month	37.6740	33.1711	35.2604	31.4819	30.7314	27.9521	27.9769	29.0842	29.3510	32.3597	33.8687	37.3684	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	145.9975	161.6401	145.9975	150.8641	145.9975	150.8641	145.9975	145.9975	150.8641	145.9975	150.8641	145.9975	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	240.8328	243.3319	237.0343	223.6274	206.7036	190.7976	180.1714	177.6723	183.9699	197.3768	214.3007	230.2066	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	(71)
Water heating gains (Table 5)	50.6372	49.3618	47.3930	43.7248	41.3056	38.8224	37.6034	39.0917	40.7652	43.4942	47.0399	50.2264	(72)
Total internal gains	500.0470	516.9133	493.0043	480.7957	456.5862	443.0635	426.3517	425.3410	438.1787	449.4480	474.7841	489.0100	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	4.9800	19.6403	0.3000	0.0000	0.7700	22.5938	(76)
West	3.5300	19.6403	0.3000	0.0000	0.7700	16.0153	(80)

Solar gains	38.6090	75.5274	124.3829	181.4051	222.3188	227.5828	216.6681	186.1147	144.6625	89.6197	48.1409	31.7502	(83)

Total gains	538.6560	592.4407	617.3872	662.2009	678.9049	670.6464	643.0199	611.4557	582.8412	539.0677	522.9250	520.7602	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	24.2446	24.3127	24.3798	24.7000	24.7608	25.0481	25.0481	25.1020	24.9366	24.7608	24.6381	24.5110	
alpha	2.6163	2.6208	2.6253	2.6467	2.6507	2.6699	2.6699	2.6735	2.6624	2.6507	2.6425	2.6341	
util living area	0.9559	0.9417	0.9214	0.8722	0.7931	0.6608	0.5283	0.5653	0.7427	0.8840	0.9385	0.9594	(86)
MIT	18.4198	18.6789	19.0881	19.7002	20.2511	20.6888	20.8776	20.8494	20.5410	19.8360	19.0522	18.3883	(87)
Th 2	20.0850	20.0874	20.0897	20.1004	20.1024	20.1118	20.1118	20.1136	20.1082	20.1024	20.0984	20.0941	(88)
util rest of house	0.9503	0.9342	0.9107	0.8536	0.7597	0.6014	0.4422	0.4812	0.6918	0.8635	0.9294	0.9542	(89)
MIT 2	17.7111	17.9680	18.3730	18.9767	19.5019	19.9005	20.0485	20.0317	19.7770	19.1170	18.3471	17.6860	(90)
Living area fraction										fLA = Living area / (4) =		0.3196	(91)
MIT	17.9375	18.1952	18.6016	19.2080	19.7413	20.1525	20.3135	20.2930	20.0212	19.3468	18.5724	17.9105	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.9375	18.1952	18.6016	19.2080	19.7413	20.1525	20.3135	20.2930	20.0212	19.3468	18.5724	17.9105	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9326	0.9142	0.8887	0.8315	0.7445	0.6044	0.4629	0.4994	0.6862	0.8424	0.9094	0.9374	(94)
Useful gains	502.3694	541.5870	548.6931	550.6202	505.4243	405.3280	297.6315	305.3646	399.9404	454.1350	475.5614	488.1676	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1237.9208	1203.4648	1092.4050	918.4345	714.7182	487.8473	326.2740	341.3136	522.5687	777.4204	1024.7572	1231.0144	(97)
Space heating kWh	547.2502	444.7819	404.5217	264.8262	155.7146	0.0000	0.0000	0.0000	0.0000	240.5244	395.4210	552.6780	(98a)
Space heating requirement - total per year (kWh/year)												3005.7180	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	547.2502	444.7819	404.5217	264.8262	155.7146	0.0000	0.0000	0.0000	0.0000	240.5244	395.4210	552.6780	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3005.7180	
Space heating per m2											(98c) / (4) =	33.0444	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	825.8978	650.1748	666.3128	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.6697	0.7435	0.7164	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	553.1317	483.4155	477.3560	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	708.6181	679.8104	645.9957	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	111.9502	146.1178	125.4679	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	27.9876	36.5295	31.3670	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												95.8840	(107)
Energy for space heating												33.0444	(99)
Energy for space cooling												1.0541	(108)
Total												34.0985	(109)
Fabric Energy Efficiency (DFEE)												34.1	(109)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	41.1800	(1b) x	2.4800	(2b) =	102.1264	(1b) - (3b)
First floor	49.7800	(1c) x	2.7800	(2c) =	138.3884	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	90.9600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		240.5148	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)

Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1247 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3747 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3185 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4061	0.3982	0.3902	0.3504	0.3424	0.3026	0.3026	0.2946	0.3185	0.3424	0.3583	0.3743	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5825	0.5793	0.5761	0.5614	0.5586	0.5458	0.5458	0.5434	0.5507	0.5586	0.5642	0.5700	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			4.1400	1.0000	4.1400			(26)
TER Opening Type			8.5100	1.1450	9.7443			(27)
GF			41.1800	0.1300	5.3534			(28a)
Exposed Floor			8.6000	0.1300	1.1180			(28b)
Main	64.8536	12.6500	52.2036	0.1800	9.3966			(29a)
PIJ	49.7800		49.7800	0.1100	5.4758			(30)
Total net area of external elements Aum(A, m2)			164.4136					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		35.2281			(33)
Main dwelling								
Party Wall 1			88.2100	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	87.1013 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	8.6300	0.0500	0.4315
E3 Sill	8.6300	0.0500	0.4315
E4 Jamb	28.2000	0.0500	1.4100
E5 Ground floor (normal)	13.8200	0.1600	2.2112
E16 Corner (normal)	4.9600	0.0900	0.4464
E12 Gable (insulation at ceiling level)	11.0000	0.0600	0.6600
E6 Intermediate floor within a dwelling	11.0000	0.0000	0.0000
E17 Corner (inverted - internal area greater than external area)	4.9600	-0.0900	-0.4464
P1 Party wall - Ground floor	15.2800	0.0800	1.2224
E20 Exposed floor (normal)	6.4400	0.3200	2.0608
E21 Exposed floor (inverted)	12.0800	0.3200	3.8656
E18 Party wall between dwellings	21.0400	0.0600	1.2624
P4 Party wall - Roof (insulation at ceiling level)	18.1000	0.1200	2.1720

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		15.7274 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	50.9555 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	46.2302	45.9760	45.7269	44.5568	44.3378	43.3187	43.3187	43.1299	43.7112	44.3378	44.7807	45.2438	(38)
Heat transfer coeff	97.1857	96.9316	96.6824	95.5123	95.2934	94.2742	94.2742	94.0855	94.6668	95.2934	95.7363	96.1993	(39)
Average = Sum(39)m / 12 =												95.5112	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0684	1.0657	1.0629	1.0500	1.0476	1.0364	1.0364	1.0344	1.0408	1.0476	1.0525	1.0576	(40)
HLP (average)												1.0500	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.6386 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

29.5637	29.1246	28.5063	27.3663	26.5127	25.5661	25.0549	25.6688	26.3373	27.3502	28.5137	29.4637	(42b)

Hot water usage for other uses

41.6522	40.1376	38.6230	37.1084	35.5937	34.0791	34.0791	35.5937	37.1084	38.6230	40.1376	41.6522	(42c)

Average daily hot water use (litres/day)	65.2759 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	71.2159	69.2622	67.1293	64.4747	62.1064	59.6452	59.1340	61.2626	63.4457	65.9732	68.6513	71.1160	(44)
Energy conte	112.7886	98.6285	103.1753	88.2626	83.6072	73.3408	71.5174	75.8559	78.2349	89.5249	97.8063	111.3504	(45)
Energy content (annual)										Total = Sum(45)m =		1084.0928	
Distribution loss (46)m = 0.15 x (45)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	95.8703	83.8342	87.6990	75.0232	71.0661	62.3397	60.7898	64.4775	66.4996	76.0962	83.1354	94.6479	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													

	95.8703	83.8342	87.6990	75.0232	71.0661	62.3397	60.7898	64.4775	66.4996	76.0962	83.1354	94.6479 (64)
									Total per year (kWh/year) = Sum(64)m =			921.4789 (64)
12Total per year (kWh/year)												921 (64)
Electric shower(s)												
	54.8258	48.8503	53.3426	50.9042	51.8594	49.4688	51.1178	51.8594	50.9042	53.3426	52.3396	54.8258 (64a)
								Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =				623.6406 (64a)
Heat gains from water heating, kWh/month												
	37.6740	33.1711	35.2604	31.4819	30.7314	27.9521	27.9769	29.0842	29.3510	32.3597	33.8687	37.3684 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	142.2156	157.4530	142.2156	146.9561	142.2156	146.9561	142.2156	142.2156	146.9561	142.2156	146.9561	142.2156	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	240.8328	243.3319	237.0343	223.6274	206.7036	190.7976	180.1714	177.6723	183.9699	197.3768	214.3007	230.2066	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	(71)
Water heating gains (Table 5)													
	50.6372	49.3618	47.3930	43.7248	41.3056	38.8224	37.6034	39.0917	40.7652	43.4942	47.0399	50.2264	(72)
Total internal gains													
	496.2651	512.7262	489.2224	476.8878	452.8043	439.1556	422.5699	421.5591	434.2708	445.6662	470.8762	485.2281	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	4.9800	19.6403	0.6300	0.7000	0.7700	29.8916	(76)
West	3.5300	19.6403	0.6300	0.7000	0.7700	21.1882	(80)

Solar gains	51.0797	99.9228	164.5586	239.9990	294.1277	301.0921	286.6519	246.2298	191.3885	118.5668	63.6904	42.0055	(83)
Total gains	547.3448	612.6490	653.7810	716.8868	746.9320	740.2477	709.2218	667.7889	625.6593	564.2330	534.5666	527.2336	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	22.6449	22.7043	22.7628	23.0416	23.0946	23.3442	23.3442	23.3911	23.2474	23.0946	22.9877	22.8771	
alpha	2.5097	2.5136	2.5175	2.5361	2.5396	2.5563	2.5563	2.5594	2.5498	2.5396	2.5325	2.5251	
util living area													
	0.9557	0.9398	0.9161	0.8613	0.7758	0.6421	0.5125	0.5525	0.7336	0.8808	0.9381	0.9594	(86)
MIT	18.2422	18.5281	18.9823	19.6407	20.2246	20.6750	20.8697	20.8378	20.5077	19.7511	18.9079	18.2044	(87)
Th 2	20.0267	20.0290	20.0312	20.0418	20.0438	20.0531	20.0531	20.0548	20.0495	20.0438	20.0398	20.0356	(88)
util rest of house													
	0.9499	0.9319	0.9044	0.8408	0.7395	0.5795	0.4228	0.4645	0.6796	0.8590	0.9287	0.9540	(89)
MIT 2	17.4981	17.7812	18.2298	18.8766	19.4303	19.8370	19.9879	19.9692	19.6997	18.9942	18.1669	17.4665	(90)
Living area fraction										fLA = Living area / (4) =		0.3196	(91)
MIT	17.7359	18.0199	18.4703	19.1208	19.6841	20.1048	20.2697	20.2468	19.9579	19.2361	18.4037	17.7023	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.7359	18.0199	18.4703	19.1208	19.6841	20.1048	20.2697	20.2468	19.9579	19.2361	18.4037	17.7023	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9312	0.9105	0.8807	0.8173	0.7241	0.5832	0.4446	0.4836	0.6738	0.8365	0.9075	0.9364	(94)
Useful gains	509.7024	557.7967	575.7672	585.8931	540.8308	431.7068	315.2887	322.9581	421.5423	471.9565	485.1347	493.6945	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1305.7780	1271.7336	1157.3180	976.2114	760.8353	518.9595	345.9597	361.9301	554.5528	822.9632	1082.1775	1298.9102	(97)
Space heating kWh													
	592.2802	479.7656	432.6738	281.0292	163.6834	0.0000	0.0000	0.0000	0.0000	261.1490	429.8708	599.0805	(98a)
Space heating requirement - total per year (kWh/year)												3239.5326	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	592.2802	479.7656	432.6738	281.0292	163.6834	0.0000	0.0000	0.0000	0.0000	261.1490	429.8708	599.0805	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3239.5326	
Space heating per m2											(98c) / (4) =	35.6149	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	886.1775	697.6291	715.0496	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.6784	0.7494	0.7194	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	601.1936	522.8145	514.4272	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	794.2071	761.2522	715.7953	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	138.9697	177.3976	149.8178	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)

Space cooling kWh

0.0000	0.0000	0.0000	0.0000	0.0000	34.7424	44.3494	37.4545	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement											116.5463 (107)
Energy for space heating											35.6149 (99)
Energy for space cooling											1.2813 (108)
Total											36.8962 (109)
Fabric Energy Efficiency (TFEE)											36.9 (109)

Full SAP Calculation Printout

Property Reference	78449-07	**Issued on Date**	03/10/2025
Assessment Reference	001	**Prop Type Ref**	Mid
Property	842 Rochdale Road, MANCHESTER, M9 8FA		

SAP Rating	84 B	**DER**	3.62	**TER**	11.44
Environmental	97 A	**% DER < TER**			68.36
CO_2 Emissions (t/year)	0.32	**DFEE**	34.10	**TFEE**	36.90
Compliance Check	See BREL	**% DFEE < TFEE**			7.58
% DPER < TPER	36.04	**DPER**	38.33	**TPER**	59.93

Assessor Details	Mr. Daniel Goddard	**Assessor ID**	CP52-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	41.1800 (1b)	x	2.4800 (2b)	=	102.1264	(1b) - (3b)
First floor	49.7800 (1c)	x	2.7800 (2c)	=	138.3884	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	90.9600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	240.5148	(5)

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2. Ventilation rate

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			m3 per hour
Number of open chimneys		0 * 80 =	0.0000 (6a)
Number of open flues		0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000 (6d)
Number of flues attached to other heater		0 * 35 =	0.0000 (6e)
Number of blocked chimneys		0 * 20 =	0.0000 (6f)
Number of intermittent extract fans		0 * 10 =	0.0000 (7a)
Number of passive vents		0 * 10 =	0.0000 (7b)
Number of flueless gas fires		0 * 40 =	0.0000 (7c)
			Air changes per hour
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		0.0000 / (5) =	0.0000 (8)
Pressure test			Yes
Pressure Test Method			Blower Door
Measured/design AP50			5.0000 (17)
Infiltration rate			0.2500 (18)
Number of sides sheltered			2 (19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.2125 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2709	0.2656	0.2603	0.2338	0.2284	0.2019	0.2019	0.1966	0.2125	0.2284	0.2391	0.2497	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =		81.0000 (23c)

Effective ac	0.3659	0.3606	0.3553	0.3287	0.3234	0.2969	0.2969	0.2916	0.3075	0.3234	0.3341	0.3447	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door			4.1400	1.0000	4.1400			(26)
Window			8.5100	0.7752	6.5969			(27)
GF			41.1800	0.0800	3.2944	75.0000	3088.5000	(28a)
Exposed Floor			8.6000	0.1400	1.2040	20.0000	172.0000	(28b)
Main	64.8536	12.6500	52.2036	0.1300	6.7865	9.0000	469.8324	(29a)
PIJ	49.7800		49.7800	0.1300	6.4714	9.0000	448.0200	(30)
Total net area of external elements Aum(A, m2)			164.4136					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		28.4932			(33)
Main dwelling								
Party Wall 1			88.2100	0.0000	0.0000	20.0000	1764.2000	(32)
Timber			96.4800			9.0000	868.3200	(32c)
FF			41.1800			18.0000	741.2400	(32d)
GF			41.1800			9.0000	370.6200	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 7922.7324 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 87.1013 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	8.6300	0.1150	0.9925
E3 Sill	8.6300	0.0170	0.1467
E4 Jamb	28.2000	0.0940	2.6508
E5 Ground floor (normal)	13.8200	0.0670	0.9259
E16 Corner (normal)	4.9600	0.0680	0.3373
E12 Gable (insulation at ceiling level)	11.0000	0.0770	0.8470
E6 Intermediate floor within a dwelling	11.0000	0.0320	0.3520
E17 Corner (inverted - internal area greater than external area)	4.9600	-0.0290	-0.1438
P1 Party wall - Ground floor	15.2800	0.3200	4.8896
E20 Exposed floor (normal)	6.4400	0.0790	0.5088
E21 Exposed floor (inverted)	12.0800	0.0630	0.7610
E18 Party wall between dwellings	21.0400	0.0920	1.9357
P4 Party wall - Roof (insulation at ceiling level)	18.1000	0.1020	1.8462

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 16.0496 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 44.5428 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	29.0444	28.6228	28.2011	26.0928	25.6712	23.5629	23.5629	23.1413	24.4062	25.6712	26.5145	27.3578	(38)
Heat transfer coeff	73.5872	73.1656	72.7439	70.6356	70.2140	68.1057	68.1057	67.6841	68.9490	70.2140	71.0573	71.9006	(39)
Average = Sum(39)m / 12 =												70.5302	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8090	0.8044	0.7997	0.7766	0.7719	0.7487	0.7487	0.7441	0.7580	0.7719	0.7812	0.7905	(40)
HLP (average)												0.7754	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6386 (42)
Hot water usage for mixer showers

68.4610	67.4321	65.9329	63.0644	60.9476	58.5869	57.2450	58.7329	60.3639	62.8986	65.8287	68.1987	(42a)

Hot water usage for baths

29.5637	29.1246	28.5063	27.3663	26.5127	25.5661	25.0549	25.6688	26.3373	27.3502	28.5137	29.4637	(42b)

Hot water usage for other uses

41.6522	40.1376	38.6230	37.1084	35.5937	34.0791	34.0791	35.5937	37.1084	38.6230	40.1376	41.6522	(42c)

Average daily hot water use (litres/day) 128.3946 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	139.6769	136.6944	133.0622	127.5391	123.0540	118.2321	116.3790	119.9955	123.8096	128.8717	134.4799	139.3147	(44)
Energy conte	221.2141	194.6510	204.5117	174.5947	165.6543	145.3802	140.7503	148.5795	152.6696	174.8777	191.5913	218.1331	(45)
Energy content (annual)										Total = Sum(45)m =		2132.6075	

Distribution loss (46)m = 0.15 x (45)m

33.1821	29.1976	30.6768	26.1892	24.8482	21.8070	21.1126	22.2869	22.9004	26.2317	28.7387	32.7200	(46)

Water storage loss:
Store volume 210.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.5800 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.8532 (55)
Total storage loss

26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(56)

If cylinder contains dedicated solar storage

26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(57)
23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Primary loss
Combi loss
Total heat required for water heating calculated for each month

270.9257	239.5518	254.2233	222.7027	215.3659	193.4882	190.4619	198.2911	200.7776	224.5893	239.6993	267.8447	(62)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

WWHRS
PV diverter
Solar input
FGHRS
Output from w/h

270.9257	239.5518	254.2233	222.7027	215.3659	193.4882	190.4619	198.2911	200.7776	224.5893	239.6993	267.8447	(64)

Total per year (kWh/year) = Sum(64)m = 2717.9215 (64)
12Total per year (kWh/year) 2718 (64)
Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)
Heat gains from water heating, kWh/month

113.3230	100.6421	107.7694	96.5391	94.8493	86.8253	86.5688	89.1720	89.2490	97.9161	102.1905	112.2985	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	145.9975	161.6401	145.9975	150.8641	145.9975	150.8641	145.9975	145.9975	150.8641	145.9975	150.8641	145.9975	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	240.8328	243.3319	237.0343	223.6274	206.7036	190.7976	180.1714	177.6723	183.9699	197.3768	214.3007	230.2066	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	(71)
Water heating gains (Table 5)	152.3158	149.7650	144.8514	134.0821	127.4857	120.5907	116.3559	119.8548	123.9570	131.6077	141.9313	150.9389	(72)
Total internal gains	601.7256	617.3165	590.4626	571.1531	542.7662	524.8319	505.1042	506.1041	521.3705	537.5615	569.6755	589.7225	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a	g Specific data	FF Specific data	Access factor	Gains W

					W/m2	or Table 6b		or Table 6c		Table 6d			
East					4.9800	19.6403		0.3000	0.0000	0.7700		22.5938	(76)
West					3.5300	19.6403		0.3000	0.0000	0.7700		16.0153	(80)
Solar gains	38.6090	75.5274	124.3829	181.4051	222.3188	227.5828	216.6681	186.1147	144.6625	89.6197	48.1409	31.7502	(83)
Total gains	640.3346	692.8439	714.8456	752.5582	765.0850	752.4147	721.7724	692.2188	666.0330	627.1812	617.8164	621.4727	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	29.9068	30.0792	30.2535	31.1565	31.3436	32.3139	32.3139	32.5152	31.9186	31.3436	30.9716	30.6084	
alpha	2.9938	3.0053	3.0169	3.0771	3.0896	3.1543	3.1543	3.1677	3.1279	3.0896	3.0648	3.0406	
util living area	0.9265	0.9051	0.8739	0.8005	0.6927	0.5307	0.3996	0.4294	0.6194	0.8096	0.8956	0.9309	(86)
Living	19.2282	19.4614	19.7964	20.2867	20.6516	20.8954	20.9678	20.9595	20.8198	20.3698	19.7744	19.2315	
Non living	18.6144	18.8450	19.1745	19.6594	20.0000	20.2268	20.2808	20.2795	20.1607	19.7473	19.1690	18.6294	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.0936	19.4614	19.7964	20.2867	20.6516	20.8954	20.9678	20.9595	20.8198	20.3698	19.7744	19.4788	(87)
Th 2	20.2455	20.2495	20.2536	20.2737	20.2777	20.2980	20.2980	20.3020	20.2899	20.2777	20.2697	20.2616	(88)
util rest of house	0.9187	0.8951	0.8602	0.7788	0.6590	0.4827	0.3406	0.3702	0.5727	0.7849	0.8832	0.9236	(89)
MIT 2	19.4111	18.8450	19.1745	19.6594	20.0000	20.2268	20.2808	20.2795	20.1607	19.7473	19.1690	18.8577	(90)
Living area fraction										fLA = Living area / (4) =		0.3196	(91)
MIT	19.6292	19.0420	19.3732	19.8599	20.2082	20.4405	20.5004	20.4968	20.3713	19.9462	19.3625	19.0562	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6292	19.0420	19.3732	19.8599	20.2082	20.4405	20.5004	20.4968	20.3713	19.9462	19.3625	19.0562	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9114	0.8762	0.8417	0.7653	0.6556	0.4927	0.3579	0.3870	0.5783	0.7723	0.8653	0.9093	(94)
Useful gains	583.6055	607.0518	601.6955	575.9327	501.6028	370.7506	258.3504	267.9168	385.1931	484.3734	534.5741	565.0785	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1128.0364	1034.7055	936.4503	774.1591	597.3978	397.7702	265.6377	277.2882	432.4032	656.2346	871.3380	1068.1696	(97)
Space heating kWh	405.0565	287.3833	249.0575	142.7230	71.2714	0.0000	0.0000	0.0000	0.0000	127.8647	242.4700	374.2997	(98a)
Space heating requirement - total per year (kWh/year)												1900.1263	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	405.0565	287.3833	249.0575	142.7230	71.2714	0.0000	0.0000	0.0000	0.0000	127.8647	242.4700	374.2997	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1900.1263	
Space heating per m2											(98c) / (4) =	20.8897	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												270.7081	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	405.0565	287.3833	249.0575	142.7230	71.2714	0.0000	0.0000	0.0000	0.0000	127.8647	242.4700	374.2997	(98)
Space heating efficiency (main heating system 1)	270.7081	270.7081	270.7081	270.7081	270.7081	0.0000	0.0000	0.0000	0.0000	270.7081	270.7081	270.7081	(210)
Space heating fuel (main heating system)	149.6285	106.1598	92.0022	52.7221	26.3278	0.0000	0.0000	0.0000	0.0000	47.2334	89.5688	138.2669	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	270.9257	239.5518	254.2233	222.7027	215.3659	193.4882	190.4619	198.2911	200.7776	224.5893	239.6993	267.8447	(64)
Efficiency of water heater												281.1060	(216)
(217)m	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	(217)
Fuel for water heating, kWh/month	96.3785	85.2176	90.4368	79.2237	76.6138	68.8310	67.7545	70.5396	71.4242	79.8949	85.2701	95.2824	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	29.6563	26.7864	29.6563	28.6997	29.6563	28.6997	29.6563	29.6563	28.6997	29.6563	28.6997	29.6563	(231)
Lighting	30.8703	24.7653	22.2984	16.3368	12.6190	10.3098	11.5115	14.9631	19.4355	25.5005	28.8027	31.7283	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	701.9096	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	281.1060	
Water heating fuel used	966.8671	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.1900)		
mechanical ventilation fans (SFP = 1.1900)	349.1794	(230a)
Total electricity for the above, kWh/year	349.1794	(231)
Electricity for lighting (calculated in Appendix L)	249.1413	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2267.0974	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	701.9096	0.1552	108.9520	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	966.8671	0.1410	136.2905	(264)
Space and water heating			245.2426	(265)
Pumps, fans and electric keep-hot	349.1794	0.1387	48.4355	(267)
Energy for lighting	249.1413	0.1443	35.9588	(268)
Total CO2, kg/year			329.6368	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.6200	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	701.9096	1.5746	1105.2587	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	966.8671	1.5212	1470.8230	(278)
Space and water heating			2576.0817	(279)
Pumps, fans and electric keep-hot	349.1794	1.5128	528.2386	(281)
Energy for lighting	249.1413	1.5338	382.1413	(282)
Total Primary energy kWh/year			3486.4616	(286)
Dwelling Primary energy Rate (DPER)			38.3300	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	41.1800	(1b)	x 2.4800	(2b) =	102.1264	(1b) - (3b)
First floor	49.7800	(1c)	x 2.7800	(2c) =	138.3884	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	90.9600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		240.5148	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1247	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3747	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3185	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)

Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4061	0.3982	0.3902	0.3504	0.3424	0.3026	0.3026	0.2946	0.3185	0.3424	0.3583	0.3743 (22b)
Effective ac	0.5825	0.5793	0.5761	0.5614	0.5586	0.5458	0.5458	0.5434	0.5507	0.5586	0.5642	0.5700 (25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			4.1400	1.0000	4.1400			(26)
TER Opening Type			8.5100	1.1450	9.7443			(27)
GF			41.1800	0.1300	5.3534			(28a)
Exposed Floor			8.6000	0.1300	1.1180			(28b)
Main	64.8536	12.6500	52.2036	0.1800	9.3966			(29a)
PIJ	49.7800		49.7800	0.1100	5.4758			(30)
Total net area of external elements Aum(A, m2)			164.4136					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	35.2281			(33)
Main dwelling								
Party Wall 1			88.2100	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	87.1013	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	8.6300	0.0500	0.4315
E3 Sill	8.6300	0.0500	0.4315
E4 Jamb	28.2000	0.0500	1.4100
E5 Ground floor (normal)	13.8200	0.1600	2.2112
E16 Corner (normal)	4.9600	0.0900	0.4464
E12 Gable (insulation at ceiling level)	11.0000	0.0600	0.6600
E6 Intermediate floor within a dwelling	11.0000	0.0000	0.0000
E17 Corner (inverted - internal area greater than external area)	4.9600	-0.0900	-0.4464
P1 Party wall - Ground floor	15.2800	0.0800	1.2224
E20 Exposed floor (normal)	6.4400	0.3200	2.0608
E21 Exposed floor (inverted)	12.0800	0.3200	3.8656
E18 Party wall between dwellings	21.0400	0.0600	1.2624
P4 Party wall - Roof (insulation at ceiling level)	18.1000	0.1200	2.1720

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		15.7274	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	50.9555	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	46.2302	45.9760	45.7269	44.5568	44.3378	43.3187	43.3187	43.1299	43.7112	44.3378	44.7807	45.2438	(38)
Heat transfer coeff	97.1857	96.9316	96.6824	95.5123	95.2934	94.2742	94.2742	94.0855	94.6668	95.2934	95.7363	96.1993	(39)
Average = Sum(39)m / 12 =												95.5112	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0684	1.0657	1.0629	1.0500	1.0476	1.0364	1.0364	1.0344	1.0408	1.0476	1.0525	1.0576	(40)
HLP (average)												1.0500	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy											2.6386	(42)
Hot water usage for mixer showers	68.4610	67.4321	65.9329	63.0644	60.9476	58.5869	57.2450	58.7329	60.3639	62.8986	65.8287	68.1987 (42a)
Hot water usage for baths	29.5637	29.1246	28.5063	27.3663	26.5127	25.5661	25.0549	25.6688	26.3373	27.3502	28.5137	29.4637 (42b)
Hot water usage for other uses	41.6522	40.1376	38.6230	37.1084	35.5937	34.0791	34.0791	35.5937	37.1084	38.6230	40.1376	41.6522 (42c)
Average daily hot water use (litres/day)												128.3946 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	139.6769	136.6944	133.0622	127.5391	123.0540	118.2321	116.3790	119.9955	123.8096	128.8717	134.4799	139.3147	(44)
Energy conte	221.2141	194.6510	204.5117	174.5947	165.6543	145.3802	140.7503	148.5795	152.6696	174.8777	191.5913	218.1331	(45)
Energy content (annual)										Total = Sum(45)m =		2132.6075	
Distribution loss (46)m = 0.15 x (45)m	33.1821	29.1976	30.6768	26.1892	24.8482	21.8070	21.1126	22.2869	22.9004	26.2317	28.7387	32.7200	(46)
Water storage loss:													
Store volume												210.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7016	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.9188	(55)
Total storage loss	28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842	(56)
If cylinder contains dedicated solar storage	28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	272.9607	241.3898	256.2583	224.6720	217.4009	195.4575	192.4969	200.3261	202.7469	226.6243	241.6687	269.8797	(62)
WWHRS	-31.2975	-27.6798	-28.9847	-24.0004	-22.3675	-19.1401	-17.9408	-19.0782	-19.8031	-23.3456	-26.4477	-30.7179	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	241.6632	213.7101	227.2737	200.6716	195.0334	176.3175	174.5562	181.2479	182.9439	203.2787	215.2209	239.1618	(64)
										Total per year (kWh/year) = Sum(64)m =		2451.0786	(64)
12Total per year (kWh/year)												2451	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	114.9510	102.1125	109.3974	98.1146	96.4773	88.4008	88.1968	90.7999	90.8245	99.5441	103.7660	113.9265	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

(66)m	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	142.2156	157.4530	142.2156	146.9561	142.2156	146.9561	142.2156	142.2156	146.9561	142.2156	146.9561	142.2156	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	240.8328	243.3319	237.0343	223.6274	206.7036	190.7976	180.1714	177.6723	183.9699	197.3768	214.3007	230.2066	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	(71)
Water heating gains (Table 5)													
	154.5040	151.9532	147.0395	136.2703	129.6738	122.7789	118.5440	122.0429	126.1452	133.7959	144.1194	153.1270	(72)
Total internal gains													
	603.1319	618.3176	591.8689	572.4333	544.1725	523.1121	503.5105	504.5103	519.6507	538.9678	570.9557	591.1288	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	4.9800	19.6403	0.6300	0.7000	0.7700	29.8916	(76)
West	3.5300	19.6403	0.6300	0.7000	0.7700	21.1882	(80)

Solar gains	51.0797	99.9228	164.5586	239.9990	294.1277	301.0921	286.6519	246.2298	191.3885	118.5668	63.6904	42.0055	(83)
Total gains	654.2116	718.2404	756.4276	812.4323	838.3003	824.2042	790.1625	750.7401	711.0392	657.5346	634.6461	633.1343	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	22.6449	22.7043	22.7628	23.0416	23.0946	23.3442	23.3442	23.3911	23.2474	23.0946	22.9877	22.8771	
alpha	2.5097	2.5136	2.5175	2.5361	2.5396	2.5563	2.5563	2.5594	2.5498	2.5396	2.5325	2.5251	
util living area													
	0.9363	0.9179	0.8900	0.8294	0.7371	0.6002	0.4715	0.5071	0.6872	0.8450	0.9135	0.9408	(86)
MIT	18.4665	18.7376	19.1692	19.7832	20.3219	20.7241	20.8928	20.8676	20.5829	19.8994	19.1053	18.4305	(87)
Th 2	20.0267	20.0290	20.0312	20.0418	20.0438	20.0531	20.0531	20.0548	20.0495	20.0438	20.0398	20.0356	(88)
util rest of house													
	0.9284	0.9077	0.8757	0.8060	0.6983	0.5374	0.3858	0.4222	0.6306	0.8190	0.9010	0.9333	(89)
MIT 2	17.0633	17.4054	17.9489	18.7154	19.3635	19.8213	19.9856	19.9670	19.6760	18.8716	17.8806	17.0230	(90)
Living area fraction										fLA = Living area / (4) =		0.3196	(91)
MIT	17.5118	17.8312	18.3389	19.0566	19.6698	20.1098	20.2755	20.2548	19.9659	19.2001	18.2720	17.4728	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.5118	17.8312	18.3389	19.0566	19.6698	20.1098	20.2755	20.2548	19.9659	19.2001	18.2720	17.4728	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9004	0.8773	0.8442	0.7775	0.6812	0.5414	0.4069	0.4412	0.6251	0.7913	0.8712	0.9063	(94)
Useful gains	589.0216	630.1383	638.5494	631.6864	571.0784	446.2550	321.5222	331.1952	444.4610	520.3070	552.8988	573.8331	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1283.9967	1253.4418	1144.6149	970.0843	759.4665	519.4329	346.5070	362.6828	555.3014	819.5308	1069.5680	1276.8325	(97)
Space heating kWh													
	517.0614	418.8600	376.5127	243.6465	140.1607	0.0000	0.0000	0.0000	0.0000	222.6225	372.0018	523.0315	(98a)
Space heating requirement - total per year (kWh/year)												2813.8972	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	517.0614	418.8600	376.5127	243.6465	140.1607	0.0000	0.0000	0.0000	0.0000	222.6225	372.0018	523.0315	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2813.8972	
Space heating per m2											(98c) / (4) =	30.9355	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	517.0614	418.8600	376.5127	243.6465	140.1607	0.0000	0.0000	0.0000	0.0000	222.6225	372.0018	523.0315	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	560.1966	453.8028	407.9227	263.9724	151.8534	0.0000	0.0000	0.0000	0.0000	241.1945	403.0355	566.6647	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	241.6632	213.7101	227.2737	200.6716	195.0334	176.3175	174.5562	181.2479	182.9439	203.2787	215.2209	239.1618	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.7207	85.5407	85.1837	84.4960	83.3316	79.8000	79.8000	79.8000	79.8000	84.2641	85.2751	85.7649	(217)
Fuel for water heating, kWh/month													
	281.9193	249.8345	266.8041	237.4923	234.0450	220.9492	218.7421	227.1276	229.2530	241.2400	252.3842	278.8574	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)

Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	29.5496	23.7058	21.3444	15.6378	12.0791	9.8687	11.0190	14.3229	18.6040	24.4095	27.5704	30.3709	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-38.9812	-55.1702	-79.5760	-89.7571	-96.9883	-90.5718	-89.4598	-84.3870	-75.4216	-63.2498	-42.9366	-33.6769	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-21.3144	-44.9402	-89.5251	-134.7575	-178.4789	-179.4591	-177.3409	-150.0006	-109.7478	-64.3537	-28.4842	-16.8460	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	3048.6426	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2938.6486	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	238.4821	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-2035.4247	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	4276.3487	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3048.6426	0.2100	640.2150	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2938.6486	0.2100	617.1162	(264)
Space and water heating			1257.3312	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	238.4821	0.1443	34.4203	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-840.1762	0.1345	-113.0202	
PV Unit electricity exported	-1195.2485	0.1258	-150.3985	
Total			-263.4187	(269)
Total CO2, kg/year			1040.2621	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.4400	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	3048.6426	1.1300	3444.9662	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2938.6486	1.1300	3320.6730	(278)
Space and water heating			6765.6391	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	238.4821	1.5338	365.7919	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-840.1762	1.4972	-1257.8767	
PV Unit electricity exported	-1195.2485	0.4619	-552.0620	
Total			-1809.9387	(283)
Total Primary energy kWh/year			5451.5931	(286)
Target Primary Energy Rate (TPER)			59.9300	(287)

Full SAP Calculation Printout

Property Reference	78449-07	**Issued on Date**	03/10/2025
Assessment Reference	001	**Prop Type Ref**	Mid
Property	842 Rochdale Road, MANCHESTER, M9 8FA		

SAP Rating	84 B	**DER**	3.62	**TER**	11.44
Environmental	97 A	**% DER < TER**			68.36
CO_2 Emissions (t/year)	0.32	**DFEE**	34.10	**TFEE**	36.90
Compliance Check	See BREL	**% DFEE < TFEE**			7.58
% DPER < TPER	36.04	**DPER**	38.33	**TPER**	59.93

Assessor Details	Mr. Daniel Goddard	**Assessor ID**	CP52-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	41.1800 (1b)	x	2.4800 (2b)	=	102.1264	(1b) - (3b)
First floor	49.7800 (1c)	x	2.7800 (2c)	=	138.3884	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	90.9600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	240.5148	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.2500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2125	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2709	0.2656	0.2603	0.2338	0.2284	0.2019	0.2019	0.1966	0.2125	0.2284	0.2391	0.2497	(22b)

Balanced mechanical ventilation with heat recovery		
If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =		81.0000 (23c)

Effective ac	0.3659	0.3606	0.3553	0.3287	0.3234	0.2969	0.2969	0.2916	0.3075	0.3234	0.3341	0.3447	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door			4.1400	1.0000	4.1400			(26)
Window			8.5100	0.7752	6.5969			(27)
GF			41.1800	0.0800	3.2944	75.0000	3088.5000	(28a)
Exposed Floor			8.6000	0.1400	1.2040	20.0000	172.0000	(28b)
Main	64.8536	12.6500	52.2036	0.1300	6.7865	9.0000	469.8324	(29a)
PIJ	49.7800		49.7800	0.1300	6.4714	9.0000	448.0200	(30)
Total net area of external elements Aum(A, m2)			164.4136					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		28.4932			(33)
Main dwelling								
Party Wall 1			88.2100	0.0000	0.0000	20.0000	1764.2000	(32)
Timber			96.4800			9.0000	868.3200	(32c)
FF			41.1800			18.0000	741.2400	(32d)
GF			41.1800			9.0000	370.6200	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	7922.7324	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		87.1013	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	8.6300	0.1150	0.9925
E3 Sill	8.6300	0.0170	0.1467
E4 Jamb	28.2000	0.0940	2.6508
E5 Ground floor (normal)	13.8200	0.0670	0.9259
E16 Corner (normal)	4.9600	0.0680	0.3373
E12 Gable (insulation at ceiling level)	11.0000	0.0770	0.8470
E6 Intermediate floor within a dwelling	11.0000	0.0320	0.3520
E17 Corner (inverted - internal area greater than external area)	4.9600	-0.0290	-0.1438
P1 Party wall - Ground floor	15.2800	0.3200	4.8896
E20 Exposed floor (normal)	6.4400	0.0790	0.5088
E21 Exposed floor (inverted)	12.0800	0.0630	0.7610
E18 Party wall between dwellings	21.0400	0.0920	1.9357
P4 Party wall - Roof (insulation at ceiling level)	18.1000	0.1020	1.8462

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		16.0496	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	44.5428	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	29.0444	28.6228	28.2011	26.0928	25.6712	23.5629	23.5629	23.1413	24.4062	25.6712	26.5145	27.3578	(38)
Heat transfer coeff	73.5872	73.1656	72.7439	70.6356	70.2140	68.1057	68.1057	67.6841	68.9490	70.2140	71.0573	71.9006	(39)
Average = Sum(39)m / 12 =												70.5302	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8090	0.8044	0.7997	0.7766	0.7719	0.7487	0.7487	0.7441	0.7580	0.7719	0.7812	0.7905	(40)
HLP (average)												0.7754	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.6386	(42)
Hot water usage for mixer showers	68.4610	67.4321	65.9329	63.0644	60.9476	58.5869	57.2450	58.7329	60.3639	62.8986	65.8287	68.1987	(42a)
Hot water usage for baths	29.5637	29.1246	28.5063	27.3663	26.5127	25.5661	25.0549	25.6688	26.3373	27.3502	28.5137	29.4637	(42b)
Hot water usage for other uses	41.6522	40.1376	38.6230	37.1084	35.5937	34.0791	34.0791	35.5937	37.1084	38.6230	40.1376	41.6522	(42c)
Average daily hot water use (litres/day)												128.3946	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	139.6769	136.6944	133.0622	127.5391	123.0540	118.2321	116.3790	119.9955	123.8096	128.8717	134.4799	139.3147	(44)
Energy conte	221.2141	194.6510	204.5117	174.5947	165.6543	145.3802	140.7503	148.5795	152.6696	174.8777	191.5913	218.1331	(45)
Energy content (annual)										Total = Sum(45)m =		2132.6075	
Distribution loss (46)m = 0.15 x (45)m	33.1821	29.1976	30.6768	26.1892	24.8482	21.8070	21.1126	22.2869	22.9004	26.2317	28.7387	32.7200	(46)
Water storage loss:													
Store volume												210.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5800	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8532	(55)
Total storage loss	26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(56)
If cylinder contains dedicated solar storage	26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	270.9257	239.5518	254.2233	222.7027	215.3659	193.4882	190.4619	198.2911	200.7776	224.5893	239.6993	267.8447	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	270.9257	239.5518	254.2233	222.7027	215.3659	193.4882	190.4619	198.2911	200.7776	224.5893	239.6993	267.8447	(64)
										Total per year (kWh/year) = Sum(64)m =		2717.9215	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	113.3230	100.6421	107.7694	96.5391	94.8493	86.8253	86.5688	89.1720	89.2490	97.9161	102.1905	112.2985	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	35.2685	31.3252	25.4754	19.2865	14.4169	12.1713	13.1516	17.0949	22.9447	29.1336	34.0032	36.2488	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	359.4520	363.1820	353.7825	333.7722	308.5128	284.7725	268.9125	265.1825	274.5820	294.5923	319.8517	343.5920	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	(71)
Water heating gains (Table 5)	152.3158	149.7650	144.8514	134.0821	127.4857	120.5907	116.3559	119.8548	123.9570	131.6077	141.9313	150.9389	(72)
Total internal gains	653.2794	650.5153	630.3524	593.3839	556.6585	523.7777	504.6631	508.3753	527.7268	561.5767	602.0293	637.0228	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W

East				4.9800		19.6403		0.3000		0.0000		0.7700		22.5938 (76)
West				3.5300		19.6403		0.3000		0.0000		0.7700		16.0153 (80)
Solar gains	38.6090	75.5274	124.3829	181.4051	222.3188	227.5828	216.6681	186.1147	144.6625	89.6197	48.1409	31.7502	(83)
Total gains	691.8885	726.0427	754.7353	774.7891	778.9772	751.3605	721.3312	694.4900	672.3893	651.1964	650.1702	668.7729	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	29.9068	30.0792	30.2535	31.1565	31.3436	32.3139	32.3139	32.5152	31.9186	31.3436	30.9716	30.6084	
alpha	2.9938	3.0053	3.0169	3.0771	3.0896	3.1543	3.1543	3.1677	3.1279	3.0896	3.0648	3.0406	
util living area	0.9130	0.8953	0.8598	0.7904	0.6853	0.5313	0.3998	0.4281	0.6153	0.7969	0.8839	0.9186	(86)
Living	19.3352	19.5255	19.8642	20.3151	20.6625	20.8951	20.9678	20.9598	20.8232	20.4014	19.8348	19.3320	
Non living	18.7181	18.9066	19.2387	19.6852	20.0091	20.2266	20.2808	20.2797	20.1633	19.7757	19.2264	18.7270	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.1483	19.5255	19.8642	20.3151	20.6625	20.8951	20.9678	20.9598	20.8232	20.4014	19.8348	19.5653	(87)
Th 2	20.2455	20.2495	20.2536	20.2737	20.2777	20.2980	20.2980	20.3020	20.2899	20.2777	20.2697	20.2616	(88)
util rest of house	0.9039	0.8846	0.8451	0.7682	0.6514	0.4833	0.3408	0.3691	0.5687	0.7713	0.8706	0.9102	(89)
MIT 2	19.4642	18.9066	19.2387	19.6852	20.0091	20.2266	20.2808	20.2797	20.1633	19.7757	19.2264	18.9416	(90)
Living area fraction										fLA = Living area / (4) =		0.3196	(91)
MIT	19.6828	19.1044	19.4386	19.8865	20.2180	20.4402	20.5003	20.4970	20.3742	19.9756	19.4208	19.1409	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6828	19.1044	19.4386	19.8865	20.2180	20.4402	20.5003	20.4970	20.3742	19.9756	19.4208	19.1409	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8965	0.8654	0.8269	0.7553	0.6485	0.4933	0.3581	0.3859	0.5745	0.7596	0.8526	0.8952	(94)
Useful gains	620.2474	628.3480	624.1182	585.2252	505.1566	370.6474	258.3365	268.0102	386.2635	494.6223	554.3581	598.7034	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1131.9783	1039.2719	941.2033	776.0376	598.0796	397.7520	265.6354	277.3043	432.5995	658.3016	875.4841	1074.2629	(97)
Space heating kWh	380.7278	276.1409	235.9113	137.3849	69.1347	0.0000	0.0000	0.0000	0.0000	121.7775	231.2107	353.8162	(98a)
Space heating requirement - total per year (kWh/year)												1806.1040	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	380.7278	276.1409	235.9113	137.3849	69.1347	0.0000	0.0000	0.0000	0.0000	121.7775	231.2107	353.8162	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1806.1040	
Space heating per m2											(98c) / (4) =	19.8560	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												270.7081	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	380.7278	276.1409	235.9113	137.3849	69.1347	0.0000	0.0000	0.0000	0.0000	121.7775	231.2107	353.8162	(98)
Space heating efficiency (main heating system 1)	270.7081	270.7081	270.7081	270.7081	270.7081	0.0000	0.0000	0.0000	0.0000	270.7081	270.7081	270.7081	(210)
Space heating fuel (main heating system)	140.6414	102.0069	87.1460	50.7502	25.5385	0.0000	0.0000	0.0000	0.0000	44.9848	85.4096	130.7003	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	270.9257	239.5518	254.2233	222.7027	215.3659	193.4882	190.4619	198.2911	200.7776	224.5893	239.6993	267.8447	(64)
Efficiency of water heater												281.1060	(216)
(217)m	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	(217)
Fuel for water heating, kWh/month	96.3785	85.2176	90.4368	79.2237	76.6138	68.8310	67.7545	70.5396	71.4242	79.8949	85.2701	95.2824	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	29.6563	26.7864	29.6563	28.6997	29.6563	28.6997	29.6563	29.6563	28.6997	29.6563	28.6997	29.6563	(231)
Lighting	30.8703	24.7653	22.2984	16.3368	12.6190	10.3098	11.5115	14.9631	19.4355	25.5005	28.8027	31.7283	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													

Space heating fuel - main system 1	667.1777	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	281.1060	
Water heating fuel used	966.8671	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.1900)		
mechanical ventilation fans (SFP = 1.1900)	349.1794	(230a)
Total electricity for the above, kWh/year	349.1794	(231)
Electricity for lighting (calculated in Appendix L)	249.1413	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2232.3655	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	667.1777	16.4900	110.0176	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	966.8671	16.4900	159.4364	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	349.1794	16.4900	57.5797	(249)
Energy for lighting	249.1413	16.4900	41.0834	(250)
Additional standing charges			0.0000	(251)
Total energy cost			368.1171	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.9747	(257)
SAP value		84.1999	
SAP rating (Section 12)		84	(258)
SAP band		B	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	667.1777	0.1552	103.5263	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	966.8671	0.1410	136.2905	(264)
Space and water heating			239.8168	(265)
Pumps, fans and electric keep-hot	349.1794	0.1387	48.4355	(267)
Energy for lighting	249.1413	0.1443	35.9588	(268)
Total CO2, kg/year			324.2111	(272)
CO2 emissions per m2			3.5600	(273)
EI value			96.8046	
EI rating			97	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	41.1800 (1b)	x	2.4800 (2b)	=	102.1264	(1b) - (3b)
First floor	49.7800 (1c)	x	2.7800 (2c)	=	138.3884	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 90.9600						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		240.5148	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.2500 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2125 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.6000	4.5000	4.5000	4.1000	4.2000	3.7000	3.5000	3.5000	3.7000	4.1000	4.1000	4.2000	(22)
Wind factor	1.1500	1.1250	1.1250	1.0250	1.0500	0.9250	0.8750	0.8750	0.9250	1.0250	1.0250	1.0500	(22a)
Adj infilt rate	0.2444	0.2391	0.2391	0.2178	0.2231	0.1966	0.1859	0.1859	0.1966	0.2178	0.2178	0.2231	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	81.0000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.3394	0.3341	0.3341	0.3128	0.3181	0.2916	0.2809	0.2809	0.2916	0.3128	0.3128	0.3181	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door			4.1400	1.0000	4.1400			(26)
Window			8.5100	0.7752	6.5969			(27)
GF			41.1800	0.0800	3.2944	75.0000	3088.5000	(28a)
Exposed Floor			8.6000	0.1400	1.2040	20.0000	172.0000	(28b)
Main	64.8536	12.6500	52.2036	0.1300	6.7865	9.0000	469.8324	(29a)
PIJ	49.7800		49.7800	0.1300	6.4714	9.0000	448.0200	(30)
Total net area of external elements Aum(A, m2)			164.4136					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	28.4932			(33)
Main dwelling								
Party Wall 1			88.2100	0.0000	0.0000	20.0000	1764.2000	(32)
Timber			96.4800			9.0000	868.3200	(32c)
FF			41.1800			18.0000	741.2400	(32d)
GF			41.1800			9.0000	370.6200	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) =	7922.7324 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	87.1013 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	8.6300	0.1150	0.9925
E3 Sill	8.6300	0.0170	0.1467
E4 Jamb	28.2000	0.0940	2.6508
E5 Ground floor (normal)	13.8200	0.0670	0.9259
E16 Corner (normal)	4.9600	0.0680	0.3373
E12 Gable (insulation at ceiling level)	11.0000	0.0770	0.8470
E6 Intermediate floor within a dwelling	11.0000	0.0320	0.3520
E17 Corner (inverted - internal area greater than external area)	4.9600	-0.0290	-0.1438
P1 Party wall - Ground floor	15.2800	0.3200	4.8896
E20 Exposed floor (normal)	6.4400	0.0790	0.5088
E21 Exposed floor (inverted)	12.0800	0.0630	0.7610
E18 Party wall between dwellings	21.0400	0.0920	1.9357
P4 Party wall - Roof (insulation at ceiling level)	18.1000	0.1020	1.8462

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		16.0496 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	44.5428 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	26.9362	26.5145	26.5145	24.8279	25.2495	23.1413	22.2980	22.2980	23.1413	24.8279	24.8279	25.2495	(38)
Heat transfer coeff	71.4789	71.0573	71.0573	69.3707	69.7923	67.6841	66.8408	66.8408	67.6841	69.3707	69.3707	69.7923	(39)
Average = Sum(39)m / 12 =												69.1950	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7858	0.7812	0.7812	0.7627	0.7673	0.7441	0.7348	0.7348	0.7441	0.7627	0.7627	0.7673	(40)
HLP (average)												0.7607	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.6386 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	68.4610	67.4321	65.9329	63.0644	60.9476	58.5869	57.2450	58.7329	60.3639	62.8986	65.8287	68.1987	(42a)
Hot water usage for baths	29.5637	29.1246	28.5063	27.3663	26.5127	25.5661	25.0549	25.6688	26.3373	27.3502	28.5137	29.4637	(42b)
Hot water usage for other uses	41.6522	40.1376	38.6230	37.1084	35.5937	34.0791	34.0791	35.5937	37.1084	38.6230	40.1376	41.6522	(42c)
Average daily hot water use (litres/day)												128.3946	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	139.6769	136.6944	133.0622	127.5391	123.0540	118.2321	116.3790	119.9955	123.8096	128.8717	134.4799	139.3147	(44)
Energy conte	221.2141	194.6510	204.5117	174.5947	165.6543	145.3802	140.7503	148.5795	152.6696	174.8777	191.5913	218.1331	(45)
Energy content (annual)										Total = Sum(45)m =		2132.6075	
Distribution loss (46)m = 0.15 x (45)m	33.1821	29.1976	30.6768	26.1892	24.8482	21.8070	21.1126	22.2869	22.9004	26.2317	28.7387	32.7200	(46)

Water storage loss:	
Store volume	210.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):	1.5800 (48)
Temperature factor from Table 2b	0.5400 (49)
Enter (49) or (54) in (55)	0.8532 (55)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Total storage loss	26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(56)
If cylinder contains dedicated solar storage	26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

	270.9257	239.5518	254.2233	222.7027	215.3659	193.4882	190.4619	198.2911	200.7776	224.5893	239.6993	267.8447	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	270.9257	239.5518	254.2233	222.7027	215.3659	193.4882	190.4619	198.2911	200.7776	224.5893	239.6993	267.8447	(64)
											Total per year (kWh/year) = Sum(64)m =	2717.9215	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
											Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	0.0000	(64a)
Heat gains from water heating, kWh/month													
	113.3230	100.6421	107.7694	96.5391	94.8493	86.8253	86.5688	89.1720	89.2490	97.9161	102.1905	112.2985	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	35.2685	31.3252	25.4754	19.2865	14.4169	12.1713	13.1516	17.0949	22.9447	29.1336	34.0032	36.2488	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	359.4520	363.1820	353.7825	333.7722	308.5128	284.7725	268.9125	265.1825	274.5820	294.5923	319.8517	343.5920	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	(71)
Water heating gains (Table 5)													
	152.3158	149.7650	144.8514	134.0821	127.4857	120.5907	116.3559	119.8548	123.9570	131.6077	141.9313	150.9389	(72)
Total internal gains													
	653.2794	650.5153	630.3524	593.3839	556.6585	523.7777	504.6631	508.3753	527.7268	561.5767	602.0293	637.0228	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	4.9800	16.6187	0.3000	0.0000	0.7700	19.1178	(76)
West	3.5300	16.6187	0.3000	0.0000	0.7700	13.5514	(80)

Solar gains	32.6692	67.1355	116.6090	172.9395	207.2659	216.2037	201.7650	170.7039	137.1149	82.8303	42.3057	28.7264	(83)
Total gains	685.9486	717.6508	746.9614	766.3235	763.9244	739.9813	706.4281	679.0793	664.8417	644.4070	644.3350	665.7491	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	30.7889	30.9716	30.9716	31.7246	31.5330	32.5152	32.9254	32.9254	32.5152	31.7246	31.7246	31.5330	
alpha	3.0526	3.0648	3.0648	3.1150	3.1022	3.1677	3.1950	3.1950	3.1677	3.1150	3.1150	3.1022	
util living area													
	0.9076	0.8893	0.8555	0.7783	0.6637	0.5085	0.4012	0.4240	0.6138	0.7911	0.8761	0.9127	(86)
Living	19.4724	19.6531	19.9361	20.3878	20.7157	20.9144	20.9692	20.9630	20.8310	20.4375	19.9418	19.4757	
Non living	18.8674	19.0462	19.3204	19.7636	20.0604	20.2457	20.2936	20.2899	20.1808	19.8160	19.3425	18.8828	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.2185	19.6531	19.9361	20.3878	20.7157	20.9144	20.9692	20.9630	20.8310	20.4375	19.9418	19.6889	(87)
Th 2	20.2656	20.2697	20.2697	20.2858	20.2818	20.3020	20.3102	20.3102	20.3020	20.2858	20.2858	20.2818	(88)
util rest of house													
	0.8980	0.8780	0.8404	0.7549	0.6271	0.4584	0.3429	0.3646	0.5678	0.7648	0.8618	0.9037	(89)
MIT 2	19.5503	19.0462	19.3204	19.7636	20.0604	20.2457	20.2936	20.2899	20.1808	19.8160	19.3425	19.0785	(90)
Living area fraction										fLA = Living area / (4) =		0.3196	(91)
MIT	19.7639	19.2402	19.5172	19.9631	20.2698	20.4594	20.5095	20.5050	20.3886	20.0147	19.5340	19.2736	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7639	19.2402	19.5172	19.9631	20.2698	20.4594	20.5095	20.5050	20.3886	20.0147	19.5340	19.2736	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8908	0.8595	0.8230	0.7434	0.6265	0.4700	0.3600	0.3818	0.5738	0.7539	0.8447	0.8890	(94)
Useful gains	611.0418	616.8058	614.7283	569.7172	478.5917	347.8123	254.3424	259.2418	381.4628	485.8323	544.2386	591.8804	(95)
Ext temp.	4.7000	5.3000	6.7000	9.3000	12.3000	15.0000	16.6000	16.5000	14.1000	10.8000	7.5000	4.6000	(96)
Heat loss rate W													
	1076.7501	990.5516	910.7546	739.7053	556.2338	369.5173	261.3146	267.6971	425.6384	639.2266	834.8081	1024.1033	(97)
Space heating kWh													
	346.4870	251.1572	220.2435	122.3914	57.7657	0.0000	0.0000	0.0000	0.0000	114.1253	209.2101	321.5739	(98a)
Space heating requirement - total per year (kWh/year)												1642.9541	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	346.4870	251.1572	220.2435	122.3914	57.7657	0.0000	0.0000	0.0000	0.0000	114.1253	209.2101	321.5739	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1642.9541	
Space heating per m2											(98c) / (4) =	18.0624	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)

Efficiency of main space heating system 1 (in %)												269.7489	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	346.4870	251.1572	220.2435	122.3914	57.7657	0.0000	0.0000	0.0000	0.0000	114.1253	209.2101	321.5739	(98)
Space heating efficiency (main heating system 1)													
	269.7489	269.7489	269.7489	269.7489	269.7489	0.0000	0.0000	0.0000	0.0000	269.7489	269.7489	269.7489	(210)
Space heating fuel (main heating system)													
	128.4480	93.1078	81.6476	45.3723	21.4146	0.0000	0.0000	0.0000	0.0000	42.3080	77.5573	119.2123	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	270.9257	239.5518	254.2233	222.7027	215.3659	193.4882	190.4619	198.2911	200.7776	224.5893	239.6993	267.8447	(64)
Efficiency of water heater												281.4160	(216)
(217)m	281.4160	281.4160	281.4160	281.4160	281.4160	281.4160	281.4160	281.4160	281.4160	281.4160	281.4160	281.4160	(217)
Fuel for water heating, kWh/month													
	96.2723	85.1237	90.3372	79.1365	76.5294	68.7552	67.6798	70.4619	71.3455	79.8069	85.1761	95.1775	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	29.6563	26.7864	29.6563	28.6997	29.6563	28.6997	29.6563	29.6563	28.6997	29.6563	28.6997	29.6563	(231)
Lighting	30.8703	24.7653	22.2984	16.3368	12.6190	10.3098	11.5115	14.9631	19.4355	25.5005	28.8027	31.7283	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												609.0679	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												281.4160	
Water heating fuel used												965.8020	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.1900)													
mechanical ventilation fans (SFP = 1.1900)												349.1794	(230a)
Total electricity for the above, kWh/year												349.1794	(231)
Electricity for lighting (calculated in Appendix L)												249.1413	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												2173.1906	(238)

10a. Fuel costs - using BEDF prices (583)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	609.0679	28.4300	173.1580	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	965.8020	28.4300	274.5775	(247)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(247a)
Pumps, fans and electric keep-hot	349.1794	28.4300	99.2717	(249)
Energy for lighting	249.1413	28.4300	70.8309	(250)
Additional standing charges			0.0000	(251)
Total energy cost			617.8381	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	609.0679	0.1552	94.5380	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	965.8020	0.1410	136.1404	(264)
Space and water heating			230.6784	(265)
Pumps, fans and electric keep-hot	349.1794	0.1387	48.4355	(267)
Energy for lighting	249.1413	0.1443	35.9588	(268)
Total CO2, kg/year			315.0726	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	609.0679	1.5746	959.0631	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	965.8020	1.5212	1469.2027	(278)
Space and water heating			2428.2658	(279)

Pumps, fans and electric keep-hot	349.1794	1.5128	528.2386 (281)
Energy for lighting	249.1413	1.5338	382.1413 (282)
Total Primary energy kWh/year			3338.6457 (286)

SAP 10 EPC IMPROVEMENTS

001

Current energy efficiency rating: B 84
Current environmental impact rating: A 97

N Solar water heating		Recommended
U Solar photovoltaic panels		Recommended
V2 Wind turbine		Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
N Solar water heating	+ 1.4	-£ 53	-23 kg (7.2%)
U Solar photovoltaic panels	+ 8.2	-£ 277	-207 kg (70.8%)

	Typical annual savings		Energy efficiency	Environmental impact
Recommended measures				
Solar water heating	£53	0.25 kg/m²	B 86	A 97
Solar photovoltaic panels	£277	2.27 kg/m²	A 94	A 99
Total Savings	£330	2.52 kg/m²		

Potential energy efficiency rating: A 94
Potential environmental impact rating: A 99

Fuel prices for cost data on this page from database revision number 583 TEST (01 Oct 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, West Pennines (England)):

	Current	Potential	Saving
Electricity	£618	£565	£53
Space heating	£272	£298	-£26
Water heating	£275	£196	£78
Lighting	£71	£71	£0
Generated (PV)	-£0	-£277	£277
Total cost of fuels	£618	£288	£330
Total cost of uses	£618	£288	£329
Delivered energy	24 kWh/m²	4 kWh/m²	20 kWh/m²
Carbon dioxide emissions	0.3 tonnes	0.1 tonnes	0.2 tonnes
CO2 emissions per m²	3 kg/m²	1 kg/m²	3 kg/m²
Primary energy	37 kWh/m²	16 kWh/m²	20 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	41.1800	(1b)	x 2.4800	(2b) =	102.1264	(1b) - (3b)
First floor	49.7800	(1c)	x 2.7800	(2c) =	138.3884	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	90.9600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		240.5148	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.2500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2125	(21)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													
	0.2709	0.2656	0.2603	0.2338	0.2284	0.2019	0.2019	0.1966	0.2125	0.2284	0.2391	0.2497	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	81.0000	(23c)

Effective ac	0.3659	0.3606	0.3553	0.3287	0.3234	0.2969	0.2969	0.2916	0.3075	0.3234	0.3341	0.3447	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Door			4.1400	1.0000	4.1400			(26)
Window			8.5100	0.7752	6.5969			(27)
GF			41.1800	0.0800	3.2944	75.0000	3088.5000	(28a)
Exposed Floor			8.6000	0.1400	1.2040	20.0000	172.0000	(28b)
Main	64.8536	12.6500	52.2036	0.1300	6.7865	9.0000	469.8324	(29a)
PIJ	49.7800		49.7800	0.1300	6.4714	9.0000	448.0200	(30)
Total net area of external elements Aum(A, m2)			164.4136					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	28.4932			(33)
Main dwelling								
Party Wall 1			88.2100	0.0000	0.0000	20.0000	1764.2000	(32)
Timber			96.4800			9.0000	868.3200	(32c)
FF			41.1800			18.0000	741.2400	(32d)
GF			41.1800			9.0000	370.6200	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 7922.7324	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	87.1013	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	8.6300	0.1150	0.9925
E3 Sill	8.6300	0.0170	0.1467
E4 Jamb	28.2000	0.0940	2.6508
E5 Ground floor (normal)	13.8200	0.0670	0.9259
E16 Corner (normal)	4.9600	0.0680	0.3373
E12 Gable (insulation at ceiling level)	11.0000	0.0770	0.8470
E6 Intermediate floor within a dwelling	11.0000	0.0320	0.3520
E17 Corner (inverted - internal area greater than external area)	4.9600	-0.0290	-0.1438
P1 Party wall - Ground floor	15.2800	0.3200	4.8896
E20 Exposed floor (normal)	6.4400	0.0790	0.5088
E21 Exposed floor (inverted)	12.0800	0.0630	0.7610
E18 Party wall between dwellings	21.0400	0.0920	1.9357
P4 Party wall - Roof (insulation at ceiling level)	18.1000	0.1020	1.8462

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		16.0496 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	44.5428 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	29.0444	28.6228	28.2011	26.0928	25.6712	23.5629	23.5629	23.1413	24.4062	25.6712	26.5145	27.3578	(38)
Heat transfer coeff													
	73.5872	73.1656	72.7439	70.6356	70.2140	68.1057	68.1057	67.6841	68.9490	70.2140	71.0573	71.9006	(39)
Average = Sum(39)m / 12 =												70.5302	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8090	0.8044	0.7997	0.7766	0.7719	0.7487	0.7487	0.7441	0.7580	0.7719	0.7812	0.7905	(40)
HLP (average)												0.7754	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.6386	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
68.4610	67.4321	65.9329	63.0644	60.9476	58.5869	57.2450	58.7329	60.3639	62.8986	65.8287	68.1987	(42a)

Hot water usage for baths

29.5637	29.1246	28.5063	27.3663	26.5127	25.5661	25.0549	25.6688	26.3373	27.3502	28.5137	29.4637	(42b)

Hot water usage for other uses

41.6522	40.1376	38.6230	37.1084	35.5937	34.0791	34.0791	35.5937	37.1084	38.6230	40.1376	41.6522	(42c)

Average daily hot water use (litres/day)	128.3946	(43)

Daily hot water use

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
139.6769	136.6944	133.0622	127.5391	123.0540	118.2321	116.3790	119.9955	123.8096	128.8717	134.4799	139.3147	(44)
Energy conte 221.2141	194.6510	204.5117	174.5947	165.6543	145.3802	140.7503	148.5795	152.6696	174.8777	191.5913	218.1331	(45)

Energy content (annual) Total = Sum(45)m =	2132.6075	
Distribution loss (46)m = 0.15 x (45)m		
33.1821 29.1976 30.6768 26.1892 24.8482 21.8070 21.1126 22.2869 22.9004 26.2317 28.7387 32.7200		(46)
Water storage loss:		
Store volume	210.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):	1.5800	(48)
Temperature factor from Table 2b	0.5400	(49)
Enter (49) or (54) in (55)	0.8532	(55)
Total storage loss		
26.4492 23.8896 26.4492 25.5960 26.4492 25.5960 26.4492 26.4492 25.5960 26.4492 25.5960 26.4492		(56)
If cylinder contains dedicated solar storage		
17.0031 15.3576 17.0031 16.4546 17.0031 16.4546 17.0031 17.0031 16.4546 17.0031 16.4546 17.0031		(57)
Primary loss 23.2624 21.0112 21.8667 15.7584 10.4681 9.9053 10.2355 11.1660 17.1091 21.8667 22.5120 23.2624		(59)
Combi loss 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000		(61)
Total heat required for water heating calculated for each month		
261.4795 231.0198 243.3814 206.8077 193.1255 171.7400 167.9889 176.7485 186.2333 213.7474 230.5579 258.3985		(62)
WWHRS 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000		(63a)
PV diverter -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000		(63b)
Aperture area of solar collector	3.0000	(H1)
Zero-loss collector efficiency	0.8000	(H2)
Collector linear heat loss coefficient	1.8000	(H3)
Collector 2nd order heat loss coefficient	0.0000	(H4)
Collector loop efficiency	0.9000	(H5)
Incidence angle modifier	1.0000	(H6)
Overshading factor	0.8000	(H8)
Overall heat loss coefficient of system	6.5000	(H10)
Heat loss coefficient of collector loop	3.9667	(H11)

Dedicated solar storage volume												75.0000	(H12)
If combined cylinder, total volume of cylinder												210.0000	(H13)
Effective solar volume												115.5000	(H14)
Reference volume												225.0000	(H15)
Storage tank correction coefficient												1.1814	(H16)
Heat delivered to hot water												654.6757	(H24)
Heat delivered to space heating												0.0000	(H29)
Solar input												654.6757	
Solar input	-0.0000	-20.1906	-62.4438	-83.8682	-107.6151	-99.0457	-98.2732	-86.8675	-61.6791	-33.2791	-1.4133	-0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	261.4795	210.8291	180.9377	122.9394	85.5104	72.6943	69.7156	89.8809	124.5542	180.4683	229.1446	258.3985	(64)
									Total per year (kWh/year) = Sum(64)m =			1886.5527	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month													
	105.7660	93.8165	99.0959	83.8231	77.0570	69.4268	68.5903	71.9379	77.6136	89.2426	94.8774	104.7416	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	35.2685	31.3252	25.4754	19.2865	14.4169	12.1713	13.1516	17.0949	22.9447	29.1336	34.0032	36.2488	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	359.4520	363.1820	353.7825	333.7722	308.5128	284.7725	268.9125	265.1825	274.5820	294.5923	319.8517	343.5920	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	(71)
Water heating gains (Table 5)													
	142.1587	139.6079	133.1934	116.4210	103.5712	96.4261	92.1913	96.6907	107.7967	119.9497	131.7741	140.7817	(72)
Total internal gains													
	643.1223	640.3582	618.6944	575.7228	532.7440	499.6131	480.4985	485.2112	511.5665	549.9188	591.8722	626.8656	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	4.9800	19.6403	0.3000	0.0000	0.7700	22.5938	(76)
West	3.5300	19.6403	0.3000	0.0000	0.7700	16.0153	(80)

Solar gains	38.6090	75.5274	124.3829	181.4051	222.3188	227.5828	216.6681	186.1147	144.6625	89.6197	48.1409	31.7502	(83)
Total gains	681.7313	715.8856	743.0774	757.1279	755.0628	727.1959	697.1666	671.3260	656.2290	639.5384	640.0131	658.6158	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	29.9068	30.0792	30.2535	31.1565	31.3436	32.3139	32.3139	32.5152	31.9186	31.3436	30.9716	30.6084	
alpha	2.9938	3.0053	3.0169	3.0771	3.0896	3.1543	3.1543	3.1677	3.1279	3.0896	3.0648	3.0406	
util living area													
	0.9157	0.8984	0.8640	0.7984	0.6982	0.5451	0.4122	0.4410	0.6258	0.8030	0.8876	0.9213	(86)
Living	19.3145	19.5061	19.8448	20.2926	20.6435	20.8871	20.9649	20.9562	20.8144	20.3863	19.8161	19.3108	
Non living	18.6981	18.8880	19.2203	19.6648	19.9931	20.2209	20.2792	20.2776	20.1566	19.7621	19.2087	18.7064	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.1378	19.5061	19.8448	20.2926	20.6435	20.8871	20.9649	20.9562	20.8144	20.3863	19.8161	19.5471	(87)
Th 2	20.2455	20.2495	20.2536	20.2737	20.2777	20.2980	20.2980	20.3020	20.2899	20.2777	20.2697	20.2616	(88)
util rest of house													
	0.9069	0.8878	0.8496	0.7766	0.6646	0.4966	0.3518	0.3807	0.5791	0.7779	0.8746	0.9131	(89)
MIT 2	19.4539	18.8880	19.2203	19.6648	19.9931	20.2209	20.2792	20.2776	20.1566	19.7621	19.2087	18.9240	(90)
Living area fraction										fLA = Living area / (4) =		0.3196	(91)
MIT	19.6725	19.0856	19.4199	19.8655	20.2010	20.4338	20.4983	20.4945	20.3668	19.9616	19.4028	19.1231	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6725	19.0856	19.4199	19.8655	20.2010	20.4338	20.4983	20.4945	20.3668	19.9616	19.4028	19.1231	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8995	0.8687	0.8313	0.7632	0.6608	0.5063	0.3694	0.3977	0.5844	0.7657	0.8566	0.8983	(94)
Useful gains	613.1837	621.9176	617.6904	577.8741	498.9600	368.1690	257.5291	267.0090	383.4943	489.7138	548.2439	591.6221	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1131.2183	1037.8938	939.8427	774.5522	596.8894	397.3137	265.4963	277.1319	432.0910	657.3130	874.2039	1072.9796	(97)
Space heating kWh													
	385.4178	279.5360	239.6813	141.6082	72.8594	0.0000	0.0000	0.0000	0.0000	124.6938	234.6911	358.1300	(98a)
Space heating requirement - total per year (kWh/year)												1836.6177	
Solar heating kWh													
	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	385.4178	279.5360	239.6813	141.6082	72.8594	0.0000	0.0000	0.0000	0.0000	124.6938	234.6911	358.1300	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1836.6177	
Space heating per m2											(98c) / (4) =	20.1915	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												270.7081	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	385.4178	279.5360	239.6813	141.6082	72.8594	0.0000	0.0000	0.0000	0.0000	124.6938	234.6911	358.1300	(98)
Space heating efficiency (main heating system 1)													
	270.7081	270.7081	270.7081	270.7081	270.7081	0.0000	0.0000	0.0000	0.0000	270.7081	270.7081	270.7081	(210)
Space heating fuel (main heating system)													
	142.3739	103.2610	88.5386	52.3103	26.9144	0.0000	0.0000	0.0000	0.0000	46.0621	86.6953	132.2938	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	261.4795	210.8291	180.9377	122.9394	85.5104	72.6943	69.7156	89.8809	124.5542	180.4683	229.1446	258.3985	(64)
Efficiency of water heater												281.1060	(216)
(217)m	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	(217)
Fuel for water heating, kWh/month													
	93.0181	74.9999	64.3663	43.7342	30.4193	25.8601	24.8005	31.9740	44.3086	64.1994	81.5154	91.9221	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	36.4509	32.9233	36.4509	35.2750	36.4509	35.2750	36.4509	36.4509	35.2750	36.4509	35.2750	36.4509	(231)
Lighting	30.8703	24.7653	22.2984	16.3368	12.6190	10.3098	11.5115	14.9631	19.4355	25.5005	28.8027	31.7283	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-37.4126	-55.2815	-82.5768	-94.8457	-102.3112	-93.2996	-92.1870	-86.5589	-76.2048	-63.7088	-41.7331	-31.9441	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-12.6739	-28.2985	-59.7695	-95.9263	-133.3716	-138.4141	-136.4645	-113.2151	-80.2583	-43.1370	-17.6767	-9.9697	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	678.4495	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	281.1060	
Water heating fuel used	671.1179	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.1900)		
mechanical ventilation fans (SFP = 1.1900)	349.1794	(230a)
pump for solar water heating	80.0000	(230g)
Total electricity for the above, kWh/year	429.1794	(231)
Electricity for lighting (calculated in Appendix L)	249.1413	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1727.2394	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	300.6487	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	678.4495	16.4900	111.8763	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	671.1179	16.4900	110.6673	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	349.1794	16.4900	57.5797	(249)
Pump for solar water heating	80.0000	16.4900	13.1920	(249)
Energy for lighting	249.1413	16.4900	41.0834	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-858.0643	16.4900	-141.4948	
PV Unit electricity exported	-869.1751	5.5900	-48.5869	
Total			-190.0817	(252)
Total energy cost			144.3171	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.3821	(257)
SAP value		93.8057	
SAP rating (Section 12)		94	(258)
SAP band		A	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	678.4495	0.1551	105.2275	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	671.1179	0.1462	98.1454	(264)
Space and water heating			203.3729	(265)
Pumps, fans and electric keep-hot	429.1794	0.1387	59.5325	(267)
Energy for lighting	249.1413	0.1443	35.9588	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-858.0643	0.1343	-115.2389	
PV Unit electricity exported	-869.1751	0.1239	-107.6905	
Total			-222.9293	(269)
Total CO2, kg/year			75.9348	(272)
CO2 emissions per m2			0.8300	(273)
EI value			99.2516	
EI rating			99	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	41.1800	(1b) x	2.4800	(2b) =	102.1264	(1b) - (3b)
First floor	49.7800	(1c) x	2.7800	(2c) =	138.3884	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	90.9600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		240.5148	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.2500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2125	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.6000	4.5000	4.5000	4.1000	4.2000	3.7000	3.5000	3.5000	3.7000	4.1000	4.1000	4.2000	(22)
Wind factor	1.1500	1.1250	1.1250	1.0250	1.0500	0.9250	0.8750	0.8750	0.9250	1.0250	1.0250	1.0500	(22a)
Adj infilt rate	0.2444	0.2391	0.2391	0.2178	0.2231	0.1966	0.1859	0.1859	0.1966	0.2178	0.2178	0.2231	(22b)
Balanced mechanical ventilation with heat recovery													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												81.0000	(23c)
Effective ac	0.3394	0.3341	0.3341	0.3128	0.3181	0.2916	0.2809	0.2809	0.2916	0.3128	0.3128	0.3181	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door			4.1400	1.0000	4.1400			(26)
Window			8.5100	0.7752	6.5969			(27)
GF			41.1800	0.0800	3.2944	75.0000	3088.5000	(28a)
Exposed Floor			8.6000	0.1400	1.2040	20.0000	172.0000	(28b)
Main	64.8536	12.6500	52.2036	0.1300	6.7865	9.0000	469.8324	(29a)
PIJ	49.7800		49.7800	0.1300	6.4714	9.0000	448.0200	(30)
Total net area of external elements Aum(A, m2)			164.4136					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		28.4932			(33)
Main dwelling								
Party Wall 1			88.2100	0.0000	0.0000	20.0000	1764.2000	(32)
Timber			96.4800			9.0000	868.3200	(32c)
FF			41.1800			18.0000	741.2400	(32d)
GF			41.1800			9.0000	370.6200	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		7922.7324	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							87.1013	(35)
List of Thermal Bridges								
K1 Element				Length	Psi-value	Total		

E2 Other lintels (including other steel lintels)	8.6300	0.1150	0.9925	
E3 Sill	8.6300	0.0170	0.1467	
E4 Jamb	28.2000	0.0940	2.6508	
E5 Ground floor (normal)	13.8200	0.0670	0.9259	
E16 Corner (normal)	4.9600	0.0680	0.3373	
E12 Gable (insulation at ceiling level)	11.0000	0.0770	0.8470	
E6 Intermediate floor within a dwelling	11.0000	0.0320	0.3520	
E17 Corner (inverted - internal area greater than external area)	4.9600	-0.0290	-0.1438	
P1 Party wall - Ground floor	15.2800	0.3200	4.8896	
E20 Exposed floor (normal)	6.4400	0.0790	0.5088	
E21 Exposed floor (inverted)	12.0800	0.0630	0.7610	
E18 Party wall between dwellings	21.0400	0.0920	1.9357	
P4 Party wall - Roof (insulation at ceiling level)	18.1000	0.1020	1.8462	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 16.0496 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 44.5428 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	26.9362	26.5145	26.5145	24.8279	25.2495	23.1413	22.2980	22.2980	23.1413	24.8279	24.8279	25.2495	(38)
Heat transfer coeff	71.4789	71.0573	71.0573	69.3707	69.7923	67.6841	66.8408	66.8408	67.6841	69.3707	69.3707	69.7923	(39)

Average = Sum(39)m / 12 = 69.1950

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7858	0.7812	0.7812	0.7627	0.7673	0.7441	0.7348	0.7348	0.7441	0.7627	0.7627	0.7673	(40)
HLP (average)												0.7607	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6386 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
68.4610	67.4321	65.9329	63.0644	60.9476	58.5869	57.2450	58.7329	60.3639	62.8986	65.8287	68.1987	(42a)

Hot water usage for baths

29.5637	29.1246	28.5063	27.3663	26.5127	25.5661	25.0549	25.6688	26.3373	27.3502	28.5137	29.4637	(42b)

Hot water usage for other uses

41.6522	40.1376	38.6230	37.1084	35.5937	34.0791	34.0791	35.5937	37.1084	38.6230	40.1376	41.6522	(42c)

Average daily hot water use (litres/day) 128.3946 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	139.6769	136.6944	133.0622	127.5391	123.0540	118.2321	116.3790	119.9955	123.8096	128.8717	134.4799	139.3147	(44)
Energy conte	221.2141	194.6510	204.5117	174.5947	165.6543	145.3802	140.7503	148.5795	152.6696	174.8777	191.5913	218.1331	(45)
Energy content (annual)										Total = Sum(45)m =		2132.6075	
Distribution loss (46)m = 0.15 x (45)m	33.1821	29.1976	30.6768	26.1892	24.8482	21.8070	21.1126	22.2869	22.9004	26.2317	28.7387	32.7200	(46)

Water storage loss:
Store volume 210.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.5800 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.8532 (55)
Total storage loss

26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(56)

If cylinder contains dedicated solar storage

17.0031	15.3576	17.0031	16.4546	17.0031	16.4546	17.0031	17.0031	16.4546	17.0031	16.4546	17.0031	(57)
Primary loss 23.2624	21.0112	21.8667	15.7584	10.4681	9.9053	10.2355	11.1660	17.1091	21.8667	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

261.4795	231.0198	243.3814	206.8077	193.1255	171.7400	167.9889	176.7485	186.2333	213.7474	230.5579	258.3985	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)

Aperture area of solar collector 3.0000 (H1)
Zero-loss collector efficiency 0.8000 (H2)
Collector linear heat loss coefficient 1.8000 (H3)
Collector 2nd order heat loss coefficient 0.0000 (H4)
Collector loop efficiency 0.9000 (H5)
Incidence angle modifier 1.0000 (H6)
Overshading factor 0.8000 (H8)
Overall heat loss coefficient of system 6.5000 (H10)
Heat loss coefficient of collector loop 3.9667 (H11)
Dedicated solar storage volume 75.0000 (H12)
If combined cylinder, total volume of cylinder 210.0000 (H13)
Effective solar volume 115.5000 (H14)
Reference volume 225.0000 (H15)
Storage tank correction coefficient 1.1814 (H16)
Heat delivered to hot water 599.1897 (H24)
Heat delivered to space heating 0.0000 (H29)
Solar input 599.1897

Solar input -0.0000	-14.4822	-56.8249	-79.3403	-100.2904	-94.0949	-90.8995	-78.3168	-56.9604	-27.9802	-0.0000	-0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

261.4795	216.5376	186.5565	127.4673	92.8350	77.6451	77.0894	98.4317	129.2728	185.7672	230.5579	258.3985	(64)
							Total per year (kWh/year) = Sum(64)m =				1942.0387	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
							Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =				0.0000	(64a)

Heat gains from water heating, kWh/month

105.7660	93.8165	99.0959	83.8231	77.0570	69.4268	68.5903	71.9379	77.6136	89.2426	94.8774	104.7416	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	35.2685	31.3252	25.4754	19.2865	14.4169	12.1713	13.1516	17.0949	22.9447	29.1336	34.0032	36.2488	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	359.4520	363.1820	353.7825	333.7722	308.5128	284.7725	268.9125	265.1825	274.5820	294.5923	319.8517	343.5920	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)	
Losses e.g. evaporation (negative values) (Table 5)	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	(71)
Water heating gains (Table 5)													

	142.1587	139.6079	133.1934	116.4210	103.5712	96.4261	92.1913	96.6907	107.7967	119.9497	131.7741	140.7817	(72)
Total internal gains	643.1223	640.3582	618.6944	575.7228	532.7440	499.6131	480.4985	485.2112	511.5665	549.9188	591.8722	626.8656	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	4.9800	16.6187	0.3000	0.0000	0.7700	19.1178	(76)
West	3.5300	16.6187	0.3000	0.0000	0.7700	13.5514	(80)

Solar gains	32.6692	67.1355	116.6090	172.9395	207.2659	216.2037	201.7650	170.7039	137.1149	82.8303	42.3057	28.7264	(83)
Total gains	675.7915	707.4937	735.3035	748.6623	740.0099	715.8167	682.2635	655.9152	648.6814	632.7491	634.1778	655.5920	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	30.7889	30.9716	30.9716	31.7246	31.5330	32.5152	32.9254	32.9254	32.5152	31.7246	31.7246	31.5330	
alpha	3.0526	3.0648	3.0648	3.1150	3.1022	3.1677	3.1950	3.1950	3.1677	3.1150	3.1150	3.1022	
util living area	0.9105	0.8925	0.8598	0.7866	0.6771	0.5223	0.4139	0.4372	0.6245	0.7975	0.8800	0.9156	(86)
Living	19.4520	19.6341	19.9169	20.3665	20.6987	20.9076	20.9663	20.9596	20.8224	20.4227	19.9237	19.4549	
Non living	18.8477	19.0280	19.3024	19.7444	20.0463	20.2410	20.2920	20.2879	20.1742	19.8028	19.3253	18.8626	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.2081	19.6341	19.9169	20.3665	20.6987	20.9076	20.9663	20.9596	20.8224	20.4227	19.9237	19.6710	(87)
Th 2	20.2656	20.2697	20.2697	20.2858	20.2818	20.3020	20.3102	20.3102	20.3020	20.2858	20.2858	20.2818	(88)
util rest of house	0.9012	0.8814	0.8451	0.7637	0.6407	0.4716	0.3542	0.3765	0.5784	0.7716	0.8661	0.9068	(89)
MIT 2	19.5403	19.0280	19.3024	19.7444	20.0463	20.2410	20.2920	20.2879	20.1742	19.8028	19.3253	19.0611	(90)
Living area fraction										fLA = Living area / (4) =		0.3196	(91)
MIT	19.7537	19.2217	19.4988	19.9432	20.2548	20.4541	20.5075	20.5026	20.3813	20.0009	19.5165	19.2560	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7537	19.2217	19.4988	19.9432	20.2548	20.4541	20.5075	20.5026	20.3813	20.0009	19.5165	19.2560	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8940	0.8630	0.8275	0.7517	0.6393	0.4830	0.3716	0.3938	0.5839	0.7603	0.8489	0.8923	(94)
Useful gains	604.1499	610.5443	608.4308	562.7679	473.0604	345.7264	253.5441	258.2962	378.7460	481.0579	538.3296	584.9821	(95)
Ext temp.	4.7000	5.3000	6.7000	9.3000	12.3000	15.0000	16.6000	16.5000	14.1000	10.8000	7.5000	4.6000	(96)
Heat loss rate W	1076.0231	989.2387	909.4455	738.3266	555.1862	369.1525	261.1787	267.5356	425.1462	638.2757	833.5944	1022.8793	(97)
Space heating kWh	351.0737	254.4826	223.9550	126.4022	61.1016	0.0000	0.0000	0.0000	0.0000	116.9700	212.5906	325.7955	(98a)
Space heating requirement - total per year (kWh/year)												1672.3713	
Solar heating kWh	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	351.0737	254.4826	223.9550	126.4022	61.1016	0.0000	0.0000	0.0000	0.0000	116.9700	212.5906	325.7955	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1672.3713	
Space heating per m2											(98c) / (4) =	18.3858	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												269.7489	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	351.0737	254.4826	223.9550	126.4022	61.1016	0.0000	0.0000	0.0000	0.0000	116.9700	212.5906	325.7955	(98)
Space heating efficiency (main heating system 1)	269.7489	269.7489	269.7489	269.7489	269.7489	0.0000	0.0000	0.0000	0.0000	269.7489	269.7489	269.7489	(210)
Space heating fuel (main heating system)	130.1483	94.3406	83.0235	46.8592	22.6513	0.0000	0.0000	0.0000	0.0000	43.3626	78.8106	120.7773	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	261.4795	216.5376	186.5565	127.4673	92.8350	77.6451	77.0894	98.4317	129.2728	185.7672	230.5579	258.3985	(64)
Efficiency of water heater												281.4160	(216)
(217)m	281.4160	281.4160	281.4160	281.4160	281.4160	281.4160	281.4160	281.4160	281.4160	281.4160	281.4160	281.4160	(217)
Fuel for water heating, kWh/month	92.9156	76.9457	66.2921	45.2950	32.9885	27.5909	27.3934	34.9773	45.9366	66.0116	81.9278	91.8208	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	36.4509	32.9233	36.4509	35.2750	36.4509	35.2750	36.4509	36.4509	35.2750	36.4509	35.2750	36.4509	(231)
Lighting	30.8703	24.7653	22.2984	16.3368	12.6190	10.3098	11.5115	14.9631	19.4355	25.5005	28.8027	31.7283	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-32.3272	-50.1980	-78.6403	-91.6477	-98.0326	-90.9865	-89.0327	-82.6495	-73.7822	-60.0630	-37.4118	-29.2154	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)

Electricity generated by PVs (Appendix M) (negative quantity)

(233b)m	-10.0537	-24.0953	-54.8093	-90.2216	-121.6925	-129.1415	-123.8914	-100.5827	-74.5176	-38.6885	-14.7968	-8.7066	(233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	619.9733	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	281.4160	
Water heating fuel used	690.0953	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.1900)		
mechanical ventilation fans (SFP = 1.1900)	349.1794	(230a)
pump for solar water heating	80.0000	(230g)
Total electricity for the above, kWh/year	429.1794	(231)
Electricity for lighting (calculated in Appendix L)	249.1413	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1605.1846	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	383.2047	(238)

10a. Fuel costs - using BEDF prices (583)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	619.9733	28.4300	176.2584	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	690.0953	28.4300	196.1941	(247)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(247a)
Pumps, fans and electric keep-hot	349.1794	28.4300	99.2717	(249)
Pump for solar water heating	80.0000	28.4300	22.7440	(249)
Energy for lighting	249.1413	28.4300	70.8309	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-813.9870	28.4300	-231.4165	
PV Unit electricity exported	-791.1976	5.8100	-45.9686	
Total			-277.3851	(252)
Total energy cost			287.9140	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	619.9733	0.1551	96.1865	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	690.0953	0.1458	100.6197	(264)
Space and water heating			196.8062	(265)
Pumps, fans and electric keep-hot	429.1794	0.1387	59.5325	(267)
Energy for lighting	249.1413	0.1443	35.9588	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-813.9870	0.1339	-109.0180	
PV Unit electricity exported	-791.1976	0.1237	-97.8355	
Total			-206.8535	(269)
Total CO2, kg/year			85.4440	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	619.9733	1.5744	976.0710	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	690.0953	1.5394	1062.3003	(278)
Space and water heating			2038.3713	(279)
Pumps, fans and electric keep-hot	429.1794	1.5128	649.2626	(281)
Energy for lighting	249.1413	1.5338	382.1413	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-813.9870	1.4950	-1216.8829	
PV Unit electricity exported	-791.1976	0.4538	-359.0721	
Total			-1575.9549	(283)
Total Primary energy kWh/year			1493.8202	(286)

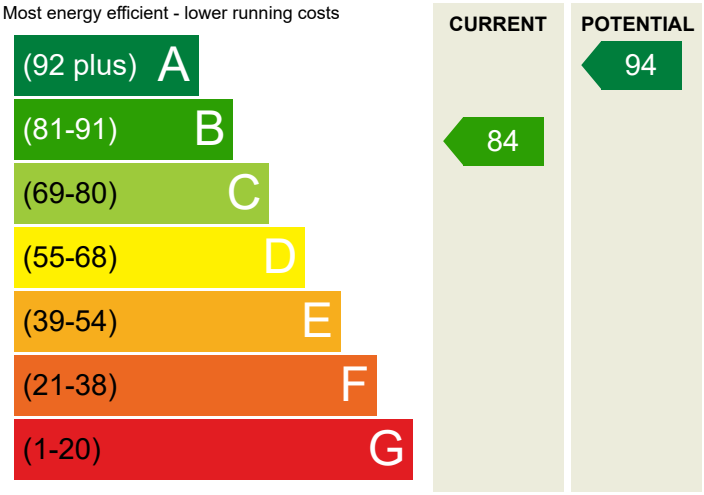
Energy Report

Dwelling Address	842 Rochdale Road, MANCHESTER, M9 8FA
Reference	78449-07-001
Assessment Date	02/07/2025
Submission Date	
Property Type	House, Mid-Terrace
Total Floor Area	91

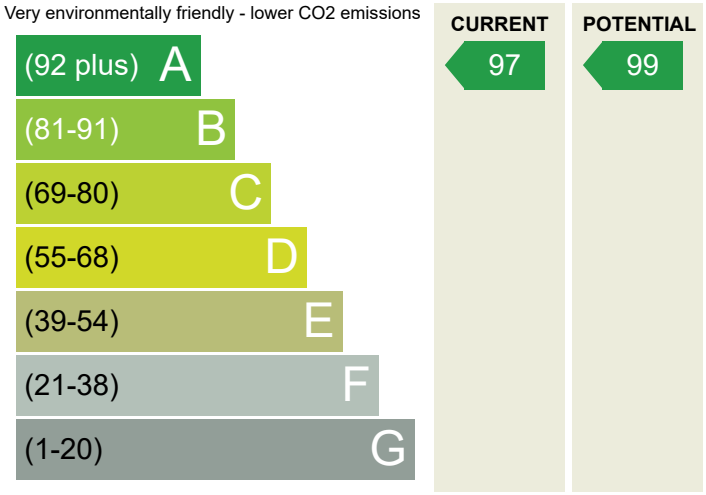
This Energy Report has been generated using the UK's National Calculation Methodology for dwellings, Standard Assessment Procedure (SAP). This methodology is used to assess the energy efficiency of dwellings which is calculated based on a dwelling's heating, hot water, ventilation and lighting usage.

This document is not an Energy Performance Certificate (EPC) as required by the Energy Performance of Buildings Regulations

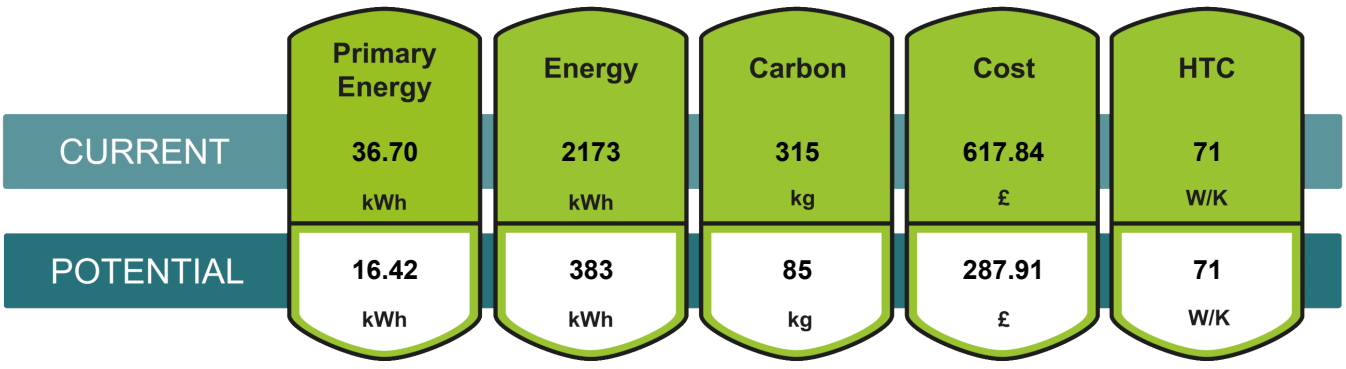
Energy Efficiency Rating



Carbon Dioxide (CO2) Emissions Rating



Additional ratings for your home



Energy Report

Breakdown of property's energy performance

Each feature is assessed as one of the following:

Very Poor | Poor | Average | Good | Very Good

Feature	Description	Energy Performance
Walls	Average thermal transmittance 0.13 W/m²K	Very Good
Roof	Average thermal transmittance 0.13 W/m²K	Very Good
Floor	Average thermal transmittance 0.09 W/m²K	Very Good
Windows	High performance glazing	Very Good
Main heating	Air source heat pump, radiators, electric	Good
Main heating controls	Programmer, room thermostat and TRVs	Good
Secondary heating	None	
Hot water	From main system	Good
Lighting	Good lighting efficiency	Good
Air tightness	Air permeability [AP50] = 5.0 m³/h.m² (as tested)	Good

Recommendations

The recommended measures provided below will help to improve the energy efficiency of the dwelling.
To reach the dwelling's potential energy rating all of the recommended measures shown below would need to be installed.
Having these measures installed individually or in any other order may give a different result when compared with the cumulative potential rating.

Recommended measures	Cumulative savings (per year)	Cumulative rating	Typical costs	Incremental savings (per year)	Cumulative CO2 rating
Solar water heating	£53	B 86	£4,000 - £7,000	£53	A 97
Photovoltaic	£330	A 94	£8,000 - £10,000	£277	A 99

Energy Report

The typical cost is based on average installation prices across the country so may not be representative of the actual costs in your area.

Estimated energy costs of the dwelling

The table below shows the estimated running costs of the space and water heating and lighting within the dwelling. It does not include the energy used from household appliances. The estimated annual costs after potential improvements indicates the total energy cost if all recommended measures named above were installed.

	Estimated annual costs	Estimated annual costs after potential improvements	Potential future savings
Lighting	£71	£71	
Heating	£272	£298	
Hot Water	£275	£196	
New Technologies e.g. Impact of PV	£0	-(£277)	
TOTAL	£618	£288	

Estimated energy use and potential savings

Space Heating
609
kWh per year

Water Heating
966
kWh per year

Energy Report

About this document

Created by:	
Company/Trading name:	
Phone number:	
Email address:	

Disclaimer

This Energy Report should not under any circumstances be treated as a Condition Survey and cannot be used to indicate that any element of the dwelling (e.g.heating system) is working correctly.
This Energy Report must not be used in situations where an Energy Performance Certificate (EPC) is required.
This Energy Report is generated from a set of data inputs which may not reflect the actual dimensions, services or construction of the dwelling.
The calculation used to generate this report reflects the SAP Methodology current at the time of report generation.

Glossary terms for additional metrics

Primary Energy	The measure of the energy required for lighting, heating and hot water in a property. This includes the efficiency of the property's heating system, power station efficiency for electricity and the energy used to produce the fuel and deliver it to the property.
Energy Used	The estimated amount of fuel energy for lighting, heating and hot water for the property. The estimate is based on typical usage which is likely to be different to actual consumption.
Carbon (CO2)	The current emissions based on the energy estimates.
Cost	The estimated cost of energy. The cost of each unit of fuel is based on an industry standard which is likely to be different to those the occupier actually pays.
Heat Transfer Coefficient	Heat flow through the property envelope where internal and external temperatures are different.

Building Regulations England Part L (BREL) Compliance Report

Approved Document L1 2021 Edition, England assessed by Array SAP 10 program, Array

Date: Fri 03 Oct 2025 15:03:27

Project Information			
Assessed By	Paul Goddard	Building Type	House, End-terrace
OCDEA Registration	EES/005113	Assessment Date	2025-10-03

Dwelling Details			
Assessment Type	As built	Total Floor Area	120 m^2
Site Reference	78449-08	Plot Reference	001
Address	840 Rochdale Road, MANCHESTER, M9 8FA		

Client Details	
Name	-
Company	John Southworth
Address	Unit 10, Charles Street, DUKINFIELD, SK16 4SD

This report covers items included within the SAP calculations. It is not a complete report of regulations compliance.

1a Target emission rate and dwelling emission rate		
Fuel for main heating system	Electricity	
Target carbon dioxide emission rate	*10.67 $kgCO_2/m^2$*	
Dwelling carbon dioxide emission rate	3.34 $kgCO_2/m^2$	OK
1b Target primary energy rate and dwelling primary energy		
Target primary energy	*55.95 kWh_{PE}/m^2*	
Dwelling primary energy	35.29 kWh_{PE}/m^2	OK
1c Target fabric energy efficiency and dwelling fabric energy efficiency		
Target fabric energy efficiency	*38.0 kWh/m^2*	
Dwelling fabric energy efficiency	33.5 kWh/m^2	OK

2a Fabric U-values				
Element	***Maximum permitted average U-Value [W/m^2K]***	**Dwelling average U-Value [W/m^2K]**	**Element with highest individual U-Value**	
External walls	*0.26*	0.12	Walls (1) (0.13)	OK
Party walls	*0.2*	0	Party Wall (1) (0)	**N/A**
Curtain walls	*1.6*	0	N/A	**N/A**
Floors	*0.18*	0.09	Exposed Floor (0.14)	OK
Roofs	*0.16*	0.11	Roof (1) (0.13)	OK
Windows, doors, and roof windows	*1.6*	0.86	Front (1)	OK
Rooflights	*2.2*	N/A	N/A	**N/A**

2b Envelope elements (better than typically expected values are flagged with a subsequent (!))		
Name	**Net area [m^2]**	**U-Value [W/m^2K]**
Exposed wall: Walls (1)	114.82	0.13 **(!)**
Exposed wall: Walls (2)	16.77	0.09 **(!)**
Party wall: Party Wall (1)	47.6	0 **(!)**
Ground floor: GF, GF	47.06	0.09 **(!)**
Upper floor: Exposed Floor, Exposed Floor	2.72	0.14
Exposed roof: Roof (1)	15.51	0.13
Exposed roof: Roof (2)	17.54	0.13
Exposed roof: Roof (3)	26.38	0.09 **(!)**

2c Openings (better than typically expected values are flagged with a subsequent (!))				
Name	**Area [m^2]**	**Orientation**	**Frame factor**	**U-Value [W/m^2K]**
Front, Door	1.99	East	N/A	1 **(!)**
Front, Window	5.8	East	1.0	0.8 **(!)**
Rear, Window	2.81	West	1.0	0.8 **(!)**
Rear, Door	2.15	West	N/A	1 **(!)**
Side, Window	1.54	South	1.0	0.8 **(!)**

2d Thermal bridging (better than typically expected values are flagged with a subsequent (!))
Building part **1**: Thermal bridging calculated from linear thermal transmittances for each junction

Main element	Junction detail	Source	Psi value [W/mK]	Drawing / reference
External wall	E2: Other lintels (including other steel lintels)	Calculated by person with suitable expertise	0.115	Thermal Bridge Report
External wall	E3: Sill	Calculated by person with suitable expertise	0.017 **(!)**	Thermal Bridge Report
External wall	E4: Jamb	Calculated by person with suitable expertise	0.094	Thermal Bridge Report
External wall	E5: Ground floor (normal)	Calculated by person with suitable expertise	0.067	Thermal Bridge Report
External wall	E11: Eaves (insulation at rafter level)	Calculated by person with suitable expertise	0.025 **(!)**	Thermal Bridge Report
External wall	E16: Corner (normal)	Calculated by person with suitable expertise	0.068	Thermal Bridge Report
External wall	E12: Gable (insulation at ceiling level)	Calculated by person with suitable expertise	0.077	Thermal Bridge Report
External wall	E6: Intermediate floor within a dwelling	Calculated by person with suitable expertise	0.032 **(!)**	Thermal Bridge Report
External wall	E17: Corner (inverted - internal area greater than external area)	Calculated by person with suitable expertise	-0.029 **(!)**	Thermal Bridge Report
Party wall	P1: Ground floor	SAP table default	0.32	K1
External wall	E20: Exposed floor (normal)	Calculated by person with suitable expertise	0.079	Thermal Bridge Report
External wall	E21: Exposed floor (inverted)	Calculated by person with suitable expertise	0.063	Thermal Bridge Report
External wall	E13: Gable (insulation at rafter level)	Calculated by person with suitable expertise	0.074	Thermal Bridge Report
External wall	E18: Party wall between dwellings	Calculated by person with suitable expertise	0.092	Thermal Bridge Report
Roof	R6: Flat ceiling	Calculated by person with suitable expertise	-0.043	Thermal Bridge Report

3 Air permeability (better than typically expected values are flagged with a subsequent (!))		
Maximum permitted air permeability at 50Pa	*8 m^3/hm^2*	
Dwelling air permeability at 50Pa	5 m^3/hm^2, Measured value	OK
Air permeability test certificate reference		

4 Space heating	
Main heating system 1: Heat pump with radiators or underfloor heating - Electricity	
Efficiency	281.2%
Emitter type	Radiators
Flow temperature	45°C
System type	
Manufacturer	Daikin Europe NV
Model	EDLA09DA3V3
Commissioning	
Secondary heating system: N/A	
Fuel	N/A
Efficiency	N/A
Commissioning	

5 Hot water	
Cylinder/store - type: Cylinder	
Capacity	210 litres
Declared heat loss	1.58 kWh/day
Primary pipework insulated	Yes
Manufacturer	
Model	
Commissioning	
Waste water heat recovery system 1 - type: N/A	
Efficiency	
Manufacturer	
Model	

6 Controls		
Main heating 1 - type: Programmer, room thermostat and TRVs		
Function		
Ecodesign class		
Manufacturer		
Model		
Water heating - type: Cylinder thermostat and HW separately timed		
Manufacturer		
Model		

7 Lighting		
Minimum permitted light source efficacy	*75 lm/W*	
Lowest light source efficacy	80 lm/W	OK
External lights control	N/A	

8 Mechanical ventilation		
System type: Balanced whole-house mechanical ventilation with heat recovery		
Maximum permitted specific fan power	*1.5 W/(l/s)*	
Specific fan power	0.97 W/(l/s)	OK
Minimum permitted heat recovery efficiency	*73%*	
Heat recovery efficiency	89%	OK
Manufacturer/Model	DV110 Adroit	
Commissioning		

9 Local generation
N/A

10 Heat networks
N/A

11 Supporting documentary evidence	
Documentary evidence identified in 11.1 and 11.2 is needed to confirm the data values used for any calculations undertaken, manufacturer declarations made, and tests performed as reflected in this "As built" BREL Compliance Report are correct. 11.1 SAP Conventions, Appendix 1 (documentary evidence) schedules the minimum documentary evidence required. 11.2 Indicative photographic evidence of key stages during construction (guidance within Approved Document L, Volume 1 – Appendix B) that confirms the products identified in this BREL Compliance Report are used in this dwelling, and workmanship is of sufficient quality to support the calculated values claimed in 2a to 2d.	

12 Declarations	
a. Assessor Declaration	
This declaration by the assessor is confirmation that the contents of this BREL Compliance Report are a true and accurate reflection based upon the design and construction information submitted for this dwelling for the purpose of carrying out the assessment, and that the supporting documentary evidence (identified in 11.1 and 11.2) pursuant to Part L of the Building Regulations 2010 (as amended) has been reviewed in the course of preparing this BREL Compliance Report.	
Signed: Name:	Assessor ID: Date:
b. Client Declaration	
This declaration by the client is confirmation that the dwelling has been constructed and completed according to the specifications set out in this BREL Compliance Report, and that photographic evidence of key stages, as described in 11.2, has been provided to the Assessor for this dwelling.	
Signed: Name:	Organisation: Date:

Full SAP Calculation Printout

Property Reference	78449-08	**Issued on Date**	03/10/2025
Assessment Reference	001	**Prop Type Ref**	End
Property	840 Rochdale Road, MANCHESTER, M9 8FA		

SAP Rating	84 B	**DER**	3.34	**TER**	10.67
Environmental	97 A	**% DER < TER**			68.70
CO_2 Emissions (t/year)	0.38	**DFEE**	33.48	**TFEE**	37.96
Compliance Check	See BREL	**% DFEE < TFEE**			11.79
% DPER < TPER	36.93	**DPER**	35.29	**TPER**	55.95

Assessor Details	Mr. Daniel Goddard	**Assessor ID**	CP52-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.0600 (1b)	x	2.4800 (2b)	=	116.7088	(1b) - (3b)
First floor	49.7800 (1c)	x	2.7800 (2c)	=	138.3884	(1c) - (3c)
Second floor	23.4000 (1d)	x	2.7700 (2d)	=	64.8180	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	120.2400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	319.9152	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.2500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2125	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2709	0.2656	0.2603	0.2338	0.2284	0.2019	0.2019	0.1966	0.2125	0.2284	0.2391	0.2497	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	80.1000 (23c)

Effective ac	0.3704	0.3651	0.3598	0.3332	0.3279	0.3014	0.3014	0.2961	0.3120	0.3279	0.3386	0.3492	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door			4.1400	1.0000	4.1400			(26)
Window			10.1500	0.7752	7.8682			(27)
GF			47.0600	0.0900	4.2354	75.0000	3529.5000	(28a)
Exposed Floor			2.7200	0.1400	0.3808	20.0000	54.4000	(28b)
Main	129.1100	14.2900	114.8200	0.1300	14.9266	9.0000	1033.3800	(29a)
Dwarf Wall (PIRx0.72)	16.7700		16.7700	0.0900	1.5093	9.0000	150.9300	(29a)
PIJ	15.5100		15.5100	0.1300	2.0163	9.0000	139.5900	(30)
PIR	17.5400		17.5400	0.1300	2.2802	9.0000	157.8600	(30)
Residual Ceiling	26.3800		26.3800	0.0900	2.3742	9.0000	237.4200	(30)
Total net area of external elements Aum(A, m2)			255.0900					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		39.7310			(33)
Main dwelling								
Party Wall 1			47.6000	0.0000	0.0000	20.0000	952.0000	(32)

Timber	124.1700		9.0000	1117.5300 (32c)
FF	47.0600		18.0000	847.0800 (32d)
SF	23.4000		18.0000	421.2000 (32d)
GF	47.0600		9.0000	423.5400 (32e)
FF	23.4000		9.0000	210.6000 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 9275.0300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 77.1376 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	10.0000	0.1150	1.1500
E3 Sill	10.0000	0.0170	0.1700
E4 Jamb	33.0000	0.0940	3.1020
E5 Ground floor (normal)	20.0500	0.0670	1.3434
E11 Eaves (insulation at rafter level)	18.1000	0.0250	0.4525
E16 Corner (normal)	24.0800	0.0680	1.6374
E12 Gable (insulation at ceiling level)	5.6600	0.0770	0.4358
E6 Intermediate floor within a dwelling	39.5500	0.0320	1.2656
E17 Corner (inverted - internal area greater than external area)	2.4800	-0.0290	-0.0719
P1 Party wall - Ground floor	9.0500	0.3200	2.8960
E20 Exposed floor (normal)	3.3800	0.0790	0.2670
E21 Exposed floor (inverted)	3.3800	0.0630	0.2129
E13 Gable (insulation at rafter level)	8.2800	0.0740	0.6127
E18 Party wall between dwellings	10.5200	0.0920	0.9678
R6 Flat ceiling	18.1000	-0.0430	-0.7783

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 13.6630 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 53.3940 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	39.1078	38.5470	37.9861	35.1819	34.6210	31.8168	31.8168	31.2559	32.9385	34.6210	35.7427	36.8644	(38)
Heat transfer coeff	92.5019	91.9410	91.3802	88.5759	88.0150	85.2108	85.2108	84.6499	86.3325	88.0150	89.1368	90.2585	(39)
Average = Sum(39)m / 12 =												88.4357	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7693	0.7646	0.7600	0.7367	0.7320	0.7087	0.7087	0.7040	0.7180	0.7320	0.7413	0.7507	(40)
HLP (average)												0.7355	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.8642 (42)
Hot water usage for mixer showers

72.2437	71.1580	69.5759	66.5490	64.3151	61.8240	60.4080	61.9781	63.6992	66.3739	69.4659	71.9669	(42a)

Hot water usage for baths

31.1904	30.7271	30.0748	28.8721	27.9715	26.9729	26.4334	27.0812	27.7865	28.8550	30.0826	31.0849	(42b)

Hot water usage for other uses

43.9627	42.3640	40.7654	39.1667	37.5681	35.9694	35.9694	37.5681	39.1667	40.7654	42.3640	43.9627	(42c)

Average daily hot water use (litres/day) 135.4907 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	147.3967	144.2491	140.4161	134.5878	129.8547	124.7663	122.8109	126.6274	130.6524	135.9943	141.9125	147.0144	(44)
Energy conte	233.4403	205.4088	215.8143	184.2439	174.8094	153.4147	148.5292	156.7911	161.1075	184.5430	202.1803	230.1891	(45)
Energy content (annual)										Total = Sum(45)m =		2250.4717	
Distribution loss (46)m = 0.15 x (45)m	35.0160	30.8113	32.3722	27.6366	26.2214	23.0122	22.2794	23.5187	24.1661	27.6815	30.3271	34.5284	(46)
Water storage loss:													
Store volume												210.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5800	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8532	(55)
Total storage loss	26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(56)
If cylinder contains dedicated solar storage	26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	283.1519	250.3096	265.5259	232.3519	224.5210	201.5227	198.2408	206.5027	209.2155	234.2546	250.2883	279.9007	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	283.1519	250.3096	265.5259	232.3519	224.5210	201.5227	198.2408	206.5027	209.2155	234.2546	250.2883	279.9007	(64)
										Total per year (kWh/year) = Sum(64)m =		2835.7857	(64)
12Total per year (kWh/year)												2836	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	117.3882	104.2191	111.5276	99.7475	97.8934	89.4968	89.1552	91.9023	92.0546	101.1298	105.7114	116.3071	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	176.3741	195.2713	176.3741	182.2532	176.3741	182.2532	176.3741	176.3741	182.2532	176.3741	182.2532	176.3741	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	285.5253	288.4881	281.0218	265.1269	245.0625	226.2048	213.6066	210.6438	218.1101	234.0050	254.0694	272.9272	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	(71)
Water heating gains (Table 5)	157.7798	155.0879	149.9026	138.5382	131.5771	124.3011	119.8323	123.5246	127.8537	135.9272	146.8213	156.3268	(72)
Total internal gains	685.6427	704.8109	673.2621	651.8819	618.9773	598.7226	575.7765	576.5060	594.1805	612.2698	649.1075	671.5916	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	5.8000	19.6403	0.3000	0.0000	0.7700	26.3140	(76)
South	1.5400	46.7521	0.3000	0.0000	0.7700	16.6316	(78)
West	2.8100	19.6403	0.3000	0.0000	0.7700	12.7487	(80)

Solar gains	55.6943	103.6532	160.5412	222.7516	265.7955	269.5834	257.6383	225.6169	182.6072	120.0518	68.4207	46.4945	(83)
Total gains	741.3370	808.4641	833.8033	874.6335	884.7727	868.3060	833.4149	802.1229	776.7877	732.3216	717.5282	718.0861	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	27.8524	28.0223	28.1943	29.0869	29.2722	30.2356	30.2356	30.4359	29.8427	29.2722	28.9039	28.5447	
alpha	2.8568	2.8682	2.8796	2.9391	2.9515	3.0157	3.0157	3.0291	2.9895	2.9515	2.9269	2.9030	
util living area	0.9321	0.9114	0.8829	0.8163	0.7172	0.5601	0.4267	0.4559	0.6431	0.8233	0.9036	0.9364	(86)
Living	19.0181	19.2704	19.6270	20.1563	20.5652	20.8590	20.9538	20.9431	20.7712	20.2617	19.6105	19.0235	
Non living	18.4411	18.6912	19.0436	19.5700	19.9570	20.2331	20.3069	20.3037	20.1548	19.6795	19.0428	18.4580	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	19.9861	19.2704	19.6270	20.1563	20.5652	20.8590	20.9538	20.9431	20.7712	20.2617	19.6105	19.3000	(87)
Th 2	20.2800	20.2841	20.2881	20.3086	20.3127	20.3332	20.3332	20.3373	20.3250	20.3127	20.3045	20.2963	(88)
util rest of house	0.9254	0.9027	0.8710	0.7972	0.6867	0.5144	0.3685	0.3980	0.5998	0.8015	0.8930	0.9301	(89)
MIT 2	19.3393	18.6912	19.0436	19.5700	19.9570	20.2331	20.3069	20.3037	20.1548	19.6795	19.0428	18.7151	(90)
Living area fraction										fLA = Living area / (4) =		0.2917	(91)
MIT	19.5280	18.8602	19.2138	19.7411	20.1344	20.4157	20.4956	20.4902	20.3347	19.8494	19.2084	18.8857	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5280	18.8602	19.2138	19.7411	20.1344	20.4157	20.4956	20.4902	20.3347	19.8494	19.2084	18.8857	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9173	0.8819	0.8500	0.7799	0.6782	0.5203	0.3830	0.4117	0.6005	0.7850	0.8730	0.9149	(94)
Useful gains	680.0646	713.0175	708.6990	682.0895	600.0373	451.7541	319.1930	330.2521	466.4299	574.8696	626.3767	656.9742	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1408.6182	1283.5144	1161.7895	960.2573	742.3553	495.5608	331.9489	346.2389	538.2549	814.0835	1079.3070	1325.5116	(97)
Space heating kWh	542.0439	383.3739	337.0994	200.2808	105.8846	0.0000	0.0000	0.0000	0.0000	177.9752	326.1099	497.3918	(98a)
Space heating requirement - total per year (kWh/year)												2570.1594	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	542.0439	383.3739	337.0994	200.2808	105.8846	0.0000	0.0000	0.0000	0.0000	177.9752	326.1099	497.3918	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2570.1594	
Space heating per m2											(98c) / (4) =	21.3752	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	281.1500	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	542.0439	383.3739	337.0994	200.2808	105.8846	0.0000	0.0000	0.0000	0.0000	177.9752	326.1099	497.3918	(98)
Space heating efficiency (main heating system 1)	281.1500	281.1500	281.1500	281.1500	281.1500	0.0000	0.0000	0.0000	0.0000	281.1500	281.1500	281.1500	(210)
Space heating fuel (main heating system)	192.7952	136.3592	119.9002	71.2363	37.6612	0.0000	0.0000	0.0000	0.0000	63.3026	115.9914	176.9133	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	283.1519	250.3096	265.5259	232.3519	224.5210	201.5227	198.2408	206.5027	209.2155	234.2546	250.2883	279.9007	(64)
Efficiency of water heater												279.7133	(216)
(217)m	279.7133	279.7133	279.7133	279.7133	279.7133	279.7133	279.7133	279.7133	279.7133	279.7133	279.7133	279.7133	(217)
Fuel for water heating, kWh/month	101.2293	89.4879	94.9279	83.0679	80.2683	72.0462	70.8728	73.8266	74.7964	83.7481	89.4803	100.0670	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	45.0156	40.6593	45.0156	43.5635	45.0156	43.5635	45.0156	45.0156	43.5635	45.0156	43.5635	45.0156	(231)
Lighting	37.1610	29.8119	26.8423	19.6658	15.1905	12.4107	13.8573	18.0122	23.3960	30.6969	34.6720	38.1938	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													

(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	914.1594	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	279.7133	
Water heating fuel used	1013.8188	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.3580)		
mechanical ventilation fans (SFP = 1.3580)	530.0227	(230a)
Total electricity for the above, kWh/year	530.0227	(231)
Electricity for lighting (calculated in Appendix L)	299.9105	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2757.9114	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	914.1594	0.1550	141.7066	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1013.8188	0.1410	142.9349	(264)
Space and water heating			284.6415	(265)
Pumps, fans and electric keep-hot	530.0227	0.1387	73.5207	(267)
Energy for lighting	299.9105	0.1443	43.2864	(268)
Total CO2, kg/year			401.4486	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.3400	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	914.1594	1.5739	1438.7660	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1013.8188	1.5213	1542.3447	(278)
Space and water heating			2981.1107	(279)
Pumps, fans and electric keep-hot	530.0227	1.5128	801.8183	(281)
Energy for lighting	299.9105	1.5338	460.0128	(282)
Total Primary energy kWh/year			4242.9418	(286)
Dwelling Primary energy Rate (DPER)			35.2900	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)			Volume (m3)	
Main dwelling							
Ground floor	47.0600	(1b)	x 2.4800	(2b)	=	116.7088	(1b) - (3b)
First floor	49.7800	(1c)	x 2.7800	(2c)	=	138.3884	(1c) - (3c)
Second floor	23.4000	(1d)	x 2.7700	(2d)	=	64.8180	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	120.2400						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)		=	319.9152	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	4 * 10 =	40.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1250	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	

Measured/design AP50	5.0000	(17)
Infiltration rate	0.3750	(18)
Number of sides sheltered	2	(19)
Shelter factor (20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) =	0.3188	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4064	0.3985	0.3905	0.3507	0.3427	0.3028	0.3028	0.2949	0.3188	0.3427	0.3586	0.3746	(22b)
Effective ac	0.5826	0.5794	0.5762	0.5615	0.5587	0.5459	0.5459	0.5435	0.5508	0.5587	0.5643	0.5701	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			4.1400	1.0000	4.1400			(26)
TER Opening Type			10.1500	1.1450	11.6221			(27)
GF			47.0600	0.1300	6.1178			(28a)
Exposed Floor			2.7200	0.1300	0.3536			(28b)
Main	129.1100	14.2900	114.8200	0.1800	20.6676			(29a)
Dwarf Wall (PIRx0.72)	16.7700		16.7700	0.1800	3.0186			(29a)
PIJ	15.5100		15.5100	0.1100	1.7061			(30)
PIR	17.5400		17.5400	0.1100	1.9294			(30)
Residual Ceiling	26.3800		26.3800	0.1100	2.9018			(30)
Total net area of external elements Aum(A, m2)			255.0900					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		52.4570			(33)
Main dwelling								
Party Wall 1			47.6000	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	77.1376	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	10.0000	0.0500	0.5000
E3 Sill	10.0000	0.0500	0.5000
E4 Jamb	33.0000	0.0500	1.6500
E5 Ground floor (normal)	20.0500	0.1600	3.2080
E11 Eaves (insulation at rafter level)	18.1000	0.0400	0.7240
E16 Corner (normal)	24.0800	0.0900	2.1672
E12 Gable (insulation at ceiling level)	5.6600	0.0600	0.3396
E6 Intermediate floor within a dwelling	39.5500	0.0000	0.0000
E17 Corner (inverted - internal area greater than external area)	2.4800	-0.0900	-0.2232
P1 Party wall - Ground floor	9.0500	0.0800	0.7240
E20 Exposed floor (normal)	3.3800	0.3200	1.0816
E21 Exposed floor (inverted)	3.3800	0.3200	1.0816
E13 Gable (insulation at rafter level)	8.2800	0.0800	0.6624
E18 Party wall between dwellings	10.5200	0.0600	0.6312
R6 Flat ceiling	18.1000	0.0600	1.0860

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	14.1324	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	66.5894	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	61.5060	61.1674	60.8355	59.2766	58.9849	57.6271	57.6271	57.3757	58.1501	58.9849	59.5749	60.1918	(38)
Heat transfer coeff	128.0954	127.7568	127.4249	125.8660	125.5743	124.2165	124.2165	123.9651	124.7395	125.5743	126.1644	126.7812	(39)
Average = Sum(39)m / 12 =												125.8646	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0653	1.0625	1.0598	1.0468	1.0444	1.0331	1.0331	1.0310	1.0374	1.0444	1.0493	1.0544	(40)
HLP (average)												1.0468	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.8642	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	72.2437	71.1580	69.5759	66.5490	64.3151	61.8240	60.4080	61.9781	63.6992	66.3739	69.4659	71.9669	(42a)
Hot water usage for baths	31.1904	30.7271	30.0748	28.8721	27.9715	26.9729	26.4334	27.0812	27.7865	28.8550	30.0826	31.0849	(42b)
Hot water usage for other uses	43.9627	42.3640	40.7654	39.1667	37.5681	35.9694	35.9694	37.5681	39.1667	40.7654	42.3640	43.9627	(42c)
Average daily hot water use (litres/day)												135.4907	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	147.3967	144.2491	140.4161	134.5878	129.8547	124.7663	122.8109	126.6274	130.6524	135.9943	141.9125	147.0144	(44)
Energy conte	233.4403	205.4088	215.8143	184.2439	174.8094	153.4147	148.5292	156.7911	161.1075	184.5430	202.1803	230.1891	(45)
Energy content (annual)										Total = Sum(45)m =		2250.4717	
Distribution loss (46)m = 0.15 x (45)m	35.0160	30.8113	32.3722	27.6366	26.2214	23.0122	22.2794	23.5187	24.1661	27.6815	30.3271	34.5284	(46)

Water storage loss:		
Store volume	210.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):	1.7016	(48)
Temperature factor from Table 2b	0.5400	(49)
Enter (49) or (54) in (55)	0.9188	(55)

Total storage loss	28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842	(56)
If cylinder contains dedicated solar storage	28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	285.1869	252.1477	267.5609	234.3213	226.5560	203.4920	200.2757	208.5377	211.1848	236.2896	252.2577	281.9357	(62)
WWHRS	-33.0268	-29.2092	-30.5861	-25.3265	-23.6034	-20.1976	-18.9320	-20.1323	-20.8972	-24.6355	-27.9091	-32.4152	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	252.1601	222.9385	236.9748	208.9947	202.9525	183.2944	181.3437	188.4054	190.2876	211.6541	224.3486	249.5205	(64)

Total per year (kWh/year) = Sum(64)m = 2552.8750 (64)

12Total per year (kWh/year) 2553 (64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

119.0162	105.6895	113.1555	101.3230	99.5214	91.0723	90.7832	93.5303	93.6301	102.7578	107.2868	117.9351	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

172.0807	190.5179	172.0807	177.8167	172.0807	177.8167	172.0807	172.0807	177.8167	172.0807	177.8167	172.0807	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

285.5253	288.4881	281.0218	265.1269	245.0625	226.2048	213.6066	210.6438	218.1101	234.0050	254.0694	272.9272	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	(69)

Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	(71)

Water heating gains (Table 5)

159.9680	157.2761	152.0908	140.7264	133.7653	126.4893	122.0205	125.7128	130.0418	138.1154	149.0095	158.5150	(72)

Total internal gains

686.5375	705.2456	674.1568	652.6335	619.8720	596.4742	573.6713	574.4008	591.9321	613.1645	649.8591	672.4863	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	5.8000	19.6403	0.6300	0.7000	0.7700	34.8135	(76)
South	1.5400	46.7521	0.6300	0.7000	0.7700	22.0036	(78)
West	2.8100	19.6403	0.6300	0.7000	0.7700	16.8665	(80)

Solar gains	73.6836	137.1332	212.3961	294.7003	351.6474	356.6588	340.8555	298.4912	241.5893	158.8285	90.5206	61.5122	(83)
Total gains	760.2210	842.3788	886.5529	947.3339	971.5194	953.1331	914.5268	872.8920	833.5215	771.9930	740.3797	733.9985	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	20.1131	20.1664	20.2189	20.4694	20.5169	20.7412	20.7412	20.7832	20.6542	20.5169	20.4210	20.3216	
alpha	2.3409	2.3444	2.3479	2.3646	2.3678	2.3827	2.3827	2.3855	2.3769	2.3678	2.3614	2.3548	
util living area													
	0.9409	0.9233	0.8986	0.8458	0.7647	0.6383	0.5121	0.5458	0.7151	0.8581	0.9202	0.9451	(86)
MIT	18.1015	18.3932	18.8555	19.5194	20.1273	20.6149	20.8386	20.8063	20.4549	19.6785	18.8023	18.0631	(87)
Th 2	20.0292	20.0316	20.0338	20.0445	20.0465	20.0559	20.0559	20.0576	20.0523	20.0465	20.0425	20.0382	(88)
util rest of house													
	0.9339	0.9142	0.8858	0.8249	0.7293	0.5779	0.4249	0.4607	0.6622	0.8348	0.9092	0.9386	(89)
MIT 2	16.6207	16.9900	17.5748	18.4092	19.1516	19.7198	19.9480	19.9218	19.5488	18.6190	17.5187	16.5770	(90)
Living area fraction									fLA = Living area / (4) =			0.2917	(91)
MIT	17.0527	17.3993	17.9484	18.7331	19.4363	19.9809	20.2079	20.1798	19.8131	18.9281	17.8932	17.0105	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.0527	17.3993	17.9484	18.7331	19.4363	19.9809	20.2079	20.1798	19.8131	18.9281	17.8932	17.0105	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9033	0.8804	0.8498	0.7898	0.7031	0.5726	0.4399	0.4726	0.6470	0.8007	0.8757	0.9092	(94)
Useful gains	686.6911	741.6588	753.4184	748.2414	683.0305	545.7514	402.2772	412.5475	539.3193	618.1397	648.3868	667.3711	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1633.5676	1596.8759	1458.8160	1237.6549	971.4757	668.4000	448.1570	468.5684	712.6527	1045.7950	1361.7205	1624.1356	(97)
Space heating kWh													
	704.4762	574.7058	524.8158	352.3777	214.6032	0.0000	0.0000	0.0000	0.0000	318.1755	513.6003	711.8328	(98a)

Space heating requirement - total per year (kWh/year) 3914.5874

Solar heating kWh

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)

Solar heating contribution - total per year (kWh/year) 0.0000

Space heating kWh

704.4762	574.7058	524.8158	352.3777	214.6032	0.0000	0.0000	0.0000	0.0000	318.1755	513.6003	711.8328	(98c)

Space heating requirement after solar contribution - total per year (kWh/year) 3914.5874

Space heating per m2 (98c) / (4) = 32.5564 (99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (201)

Fraction of space heat from main system(s) 1.0000 (202)

Efficiency of main space heating system 1 (in %) 92.3000 (206)

Efficiency of main space heating system 2 (in %) 0.0000 (207)

Efficiency of secondary/supplementary heating system, % 0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	704.4762	574.7058	524.8158	352.3777	214.6032	0.0000	0.0000	0.0000	0.0000	318.1755	513.6003	711.8328	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	763.2461	622.6499	568.5979	381.7743	232.5062	0.0000	0.0000	0.0000	0.0000	344.7188	556.4467	771.2164	(211)

Space heating efficiency (main heating system 2)												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating												
Water heating requirement												
252.1601	222.9385	236.9748	208.9947	202.9525	183.2944	181.3437	188.4054	190.2876	211.6541	224.3486	249.5205	(64)
Efficiency of water heater												
(217)m											79.8000	(216)
86.2363	86.0864	85.7902	85.2217	84.1852	79.8000	79.8000	79.8000	79.8000	84.9717	85.8562	86.2745	(217)
Fuel for water heating, kWh/month												
292.4058	258.9707	276.2261	245.2365	241.0787	229.6923	227.2477	236.0970	238.4556	249.0877	261.3074	289.2169	(219)
Space cooling fuel requirement												
(221)m												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa												
7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting												
35.7550	28.6840	25.8267	18.9218	14.6157	11.9412	13.3329	17.3307	22.5108	29.5354	33.3602	36.7487	(232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m												
-44.8214	-63.5741	-91.8759	-103.8097	-112.2843	-104.8534	-103.5347	-97.5996	-87.1465	-72.9414	-49.4069	-38.7036	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m												
-24.0837	-50.8309	-101.3709	-152.7629	-202.5163	-203.7346	-201.3618	-170.2556	-124.4628	-72.8823	-32.2119	-19.0333	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	4241.1564	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	3045.0225	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	288.5630	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-2326.0585	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	5334.6834	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	4241.1564	0.2100	890.6428	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3045.0225	0.2100	639.4547	(264)
Space and water heating			1530.0976	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	288.5630	0.1443	41.6486	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-970.5514	0.1345	-130.5280	
PV Unit electricity exported	-1355.5071	0.1258	-170.5125	
Total			-301.0405	(269)
Total CO2, kg/year			1282.6349	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.6700	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	4241.1564	1.1300	4792.5067	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3045.0225	1.1300	3440.8754	(278)
Space and water heating			8233.3821	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	288.5630	1.5338	442.6076	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-970.5514	1.4970	-1452.9558	
PV Unit electricity exported	-1355.5071	0.4617	-625.8906	
Total			-2078.8465	(283)
Total Primary energy kWh/year			6727.2440	(286)
Target Primary Energy Rate (TPER)			55.9500	(287)

Full SAP Calculation Printout

Property Reference	78449-08	**Issued on Date**	03/10/2025
Assessment Reference	001	**Prop Type Ref**	End
Property	840 Rochdale Road, MANCHESTER, M9 8FA		

SAP Rating	84 B	**DER**	3.34	**TER**	10.67
Environmental	97 A	**% DER < TER**			68.70
CO_2 Emissions (t/year)	0.38	**DFEE**	33.48	**TFEE**	37.96
Compliance Check	See BREL	**% DFEE < TFEE**			11.79
% DPER < TPER	36.93	**DPER**	35.29	**TPER**	55.95

Assessor Details	Mr. Daniel Goddard	**Assessor ID**	CP52-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.0600 (1b)	x	2.4800 (2b)	=	116.7088	(1b) - (3b)
First floor	49.7800 (1c)	x	2.7800 (2c)	=	138.3884	(1c) - (3c)
Second floor	23.4000 (1d)	x	2.7700 (2d)	=	64.8180	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	120.2400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	319.9152	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	4 * 10 =	40.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1250	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3750	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3188	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4064	0.3985	0.3905	0.3507	0.3427	0.3028	0.3028	0.2949	0.3188	0.3427	0.3586	0.3746	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5826	0.5794	0.5762	0.5615	0.5587	0.5459	0.5459	0.5435	0.5508	0.5587	0.5643	0.5701	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door			4.1400	1.0000	4.1400			(26)
Window			10.1500	0.7752	7.8682			(27)
GF			47.0600	0.0900	4.2354	75.0000	3529.5000	(28a)
Exposed Floor			2.7200	0.1400	0.3808	20.0000	54.4000	(28b)
Main	129.1100	14.2900	114.8200	0.1300	14.9266	9.0000	1033.3800	(29a)
Dwarf Wall (PIRx0.72)	16.7700		16.7700	0.0900	1.5093	9.0000	150.9300	(29a)
PIJ	15.5100		15.5100	0.1300	2.0163	9.0000	139.5900	(30)
PIR	17.5400		17.5400	0.1300	2.2802	9.0000	157.8600	(30)
Residual Ceiling	26.3800		26.3800	0.0900	2.3742	9.0000	237.4200	(30)
Total net area of external elements Aum(A, m2)			255.0900					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		39.7310			(33)
Main dwelling								
Party Wall 1			47.6000	0.0000	0.0000	20.0000	952.0000	(32)
Timber			124.1700			9.0000	1117.5300	(32c)
FF			47.0600			18.0000	847.0800	(32d)
SF			23.4000			18.0000	421.2000	(32d)

GF	47.0600		9.0000	423.5400 (32e)
FF	23.4000		9.0000	210.6000 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 9275.0300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 77.1376 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	10.0000	0.1150	1.1500
E3 Sill	10.0000	0.0170	0.1700
E4 Jamb	33.0000	0.0940	3.1020
E5 Ground floor (normal)	20.0500	0.0670	1.3434
E11 Eaves (insulation at rafter level)	18.1000	0.0250	0.4525
E16 Corner (normal)	24.0800	0.0680	1.6374
E12 Gable (insulation at ceiling level)	5.6600	0.0770	0.4358
E6 Intermediate floor within a dwelling	39.5500	0.0320	1.2656
E17 Corner (inverted - internal area greater than external area)	2.4800	-0.0290	-0.0719
P1 Party wall - Ground floor	9.0500	0.3200	2.8960
E20 Exposed floor (normal)	3.3800	0.0790	0.2670
E21 Exposed floor (inverted)	3.3800	0.0630	0.2129
E13 Gable (insulation at rafter level)	8.2800	0.0740	0.6127
E18 Party wall between dwellings	10.5200	0.0920	0.9678
R6 Flat ceiling	18.1000	-0.0430	-0.7783

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 13.6630 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 53.3940 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	61.5060	61.1674	60.8355	59.2766	58.9849	57.6271	57.6271	57.3757	58.1501	58.9849	59.5749	60.1918	(38)
Heat transfer coeff	114.9000	114.5614	114.2295	112.6706	112.3789	111.0211	111.0211	110.7697	111.5441	112.3789	112.9690	113.5858	(39)
Average = Sum(39)m / 12 =												112.6692	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9556	0.9528	0.9500	0.9370	0.9346	0.9233	0.9233	0.9212	0.9277	0.9346	0.9395	0.9447	(40)
HLP (average)												0.9370	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.8642 (42)
Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

31.1904	30.7271	30.0748	28.8721	27.9715	26.9729	26.4334	27.0812	27.7865	28.8550	30.0826	31.0849	(42b)

Hot water usage for other uses

43.9627	42.3640	40.7654	39.1667	37.5681	35.9694	35.9694	37.5681	39.1667	40.7654	42.3640	43.9627	(42c)

Average daily hot water use (litres/day) 68.8844 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	75.1530	73.0911	70.8402	68.0388	65.5396	62.9423	62.4029	64.6493	66.9532	69.6204	72.4466	75.0476	(44)
Energy conte	119.0240	104.0808	108.8787	93.1417	88.2288	77.3949	75.4709	80.0493	82.5600	94.4742	103.2134	117.5064	(45)
Energy content (annual)										Total = Sum(45)m =		1144.0232	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	101.1704	88.4687	92.5469	79.1705	74.9945	65.7857	64.1503	68.0419	70.1760	80.3031	87.7314	99.8804	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	101.1704	88.4687	92.5469	79.1705	74.9945	65.7857	64.1503	68.0419	70.1760	80.3031	87.7314	99.8804	(64)
										Total per year (kWh/year) = Sum(64)m =		972.4197	(64)
12Total per year (kWh/year)												972	(64)
Electric shower(s)	57.8551	51.5494	56.2900	53.7168	54.7248	52.2022	53.9422	54.7248	53.7168	56.2900	55.2315	57.8551	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												658.0987	(64a)
Heat gains from water heating, kWh/month	39.7564	35.0045	37.2092	33.2218	32.4298	29.4970	29.5231	30.6917	30.9732	34.1483	35.7407	39.4339	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	176.3741	195.2713	176.3741	182.2532	176.3741	182.2532	176.3741	176.3741	182.2532	176.3741	182.2532	176.3741	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	285.5253	288.4881	281.0218	265.1269	245.0625	226.2048	213.6066	210.6438	218.1101	234.0050	254.0694	272.9272	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	(71)
Water heating gains (Table 5)	53.4360	52.0901	50.0124	46.1414	43.5885	40.9680	39.6816	41.2523	43.0183	45.8982	49.6399	53.0025	(72)
Total internal gains	581.2989	601.8130	573.3718	559.4851	530.9886	515.3895	495.6258	494.2336	509.3452	522.2408	551.9260	568.2673	(73)

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6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains

	m2	Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	factor Table 6d	W	
East	5.8000	19.6403	0.3000	0.0000	0.7700	26.3140	(76)
South	1.5400	46.7521	0.3000	0.0000	0.7700	16.6316	(78)
West	2.8100	19.6403	0.3000	0.0000	0.7700	12.7487	(80)

Solar gains	55.6943	103.6532	160.5412	222.7516	265.7955	269.5834	257.6383	225.6169	182.6072	120.0518	68.4207	46.4945	(83)
Total gains	636.9932	705.4662	733.9131	782.2367	796.7841	784.9729	753.2642	719.8506	691.9524	642.2926	620.3468	614.7618	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	22.4229	22.4892	22.5546	22.8666	22.9260	23.2064	23.2064	23.2590	23.0976	22.9260	22.8062	22.6824	
alpha	2.4949	2.4993	2.5036	2.5244	2.5284	2.5471	2.5471	2.5506	2.5398	2.5284	2.5204	2.5122	
util living area	0.9564	0.9421	0.9230	0.8779	0.8058	0.6815	0.5521	0.5866	0.7546	0.8872	0.9395	0.9599	(86)
MIT	18.2067	18.4804	18.9069	19.5451	20.1323	20.6201	20.8429	20.8111	20.4655	19.7108	18.8789	18.1750	(87)
Th 2	20.1205	20.1229	20.1252	20.1361	20.1382	20.1477	20.1477	20.1495	20.1440	20.1382	20.1340	20.1297	(88)
util rest of house	0.9513	0.9353	0.9133	0.8612	0.7758	0.6267	0.4697	0.5070	0.7081	0.8687	0.9312	0.9551	(89)
MIT 2	17.5357	17.8075	18.2305	18.8625	19.4276	19.8796	20.0611	20.0405	19.7463	19.0318	18.2121	17.5103	(90)
Living area fraction										fLA = Living area / (4) =		0.2917	(91)
MIT	17.7315	18.0038	18.4279	19.0616	19.6331	20.0956	20.2892	20.2653	19.9561	19.2299	18.4066	17.7042	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.7315	18.0038	18.4279	19.0616	19.6331	20.0956	20.2892	20.2653	19.9561	19.2299	18.4066	17.7042	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9324	0.9136	0.8893	0.8361	0.7556	0.6231	0.4843	0.5187	0.6965	0.8445	0.9096	0.9372	(94)
Useful gains	593.9080	644.4834	652.6780	654.0296	602.0366	489.0780	364.8354	373.3925	481.9748	542.4340	564.2533	576.1597	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1543.2761	1501.1939	1362.5130	1144.9186	891.5186	610.1292	409.5767	428.1561	653.2164	969.8180	1277.2965	1533.8866	(97)
Space heating kWh	706.3298	575.7095	528.1173	353.4401	215.3746	0.0000	0.0000	0.0000	0.0000	317.9737	513.3911	712.5489	(98a)
Space heating requirement - total per year (kWh/year)												3922.8850	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	706.3298	575.7095	528.1173	353.4401	215.3746	0.0000	0.0000	0.0000	0.0000	317.9737	513.3911	712.5489	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3922.8850	
Space heating per m2											(98c) / (4) =	32.6255	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	1043.5986	821.5563	841.8496	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.6280	0.7032	0.6774	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	655.3426	577.7588	570.2972	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	821.4509	788.6424	753.3630	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	119.5980	156.8974	136.2010	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	29.8995	39.2244	34.0503	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												103.1741	(107)
Energy for space heating												32.6255	(99)
Energy for space cooling												0.8581	(108)
Total												33.4835	(109)
Fabric Energy Efficiency (DFEE)												33.5	(109)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.0600	(1b)	x 2.4800	(2b) =	116.7088	(1b) - (3b)
First floor	49.7800	(1c)	x 2.7800	(2c) =	138.3884	(1c) - (3c)
Second floor	23.4000	(1d)	x 2.7700	(2d) =	64.8180	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	120.2400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		319.9152	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	4 * 10 =	40.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1250	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3750	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3188	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4064	0.3985	0.3905	0.3507	0.3427	0.3028	0.3028	0.2949	0.3188	0.3427	0.3586	0.3746	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0.0000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5826	0.5794	0.5762	0.5615	0.5587	0.5459	0.5459	0.5435	0.5508	0.5587	0.5643	0.5701	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			4.1400	1.0000	4.1400			(26)
TER Opening Type			10.1500	1.1450	11.6221			(27)
GF			47.0600	0.1300	6.1178			(28a)
Exposed Floor			2.7200	0.1300	0.3536			(28b)
Main	129.1100	14.2900	114.8200	0.1800	20.6676			(29a)
Dwarf Wall (PIRx0.72)	16.7700		16.7700	0.1800	3.0186			(29a)
PIJ	15.5100		15.5100	0.1100	1.7061			(30)
PIR	17.5400		17.5400	0.1100	1.9294			(30)
Residual Ceiling	26.3800		26.3800	0.1100	2.9018			(30)
Total net area of external elements Aum(A, m2)			255.0900					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		52.4570			(33)
Main dwelling								
Party Wall 1			47.6000	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	77.1376 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	10.0000	0.0500	0.5000
E3 Sill	10.0000	0.0500	0.5000
E4 Jamb	33.0000	0.0500	1.6500
E5 Ground floor (normal)	20.0500	0.1600	3.2080
E11 Eaves (insulation at rafter level)	18.1000	0.0400	0.7240
E16 Corner (normal)	24.0800	0.0900	2.1672
E12 Gable (insulation at ceiling level)	5.6600	0.0600	0.3396
E6 Intermediate floor within a dwelling	39.5500	0.0000	0.0000
E17 Corner (inverted - internal area greater than external area)	2.4800	-0.0900	-0.2232
P1 Party wall - Ground floor	9.0500	0.0800	0.7240
E20 Exposed floor (normal)	3.3800	0.3200	1.0816
E21 Exposed floor (inverted)	3.3800	0.3200	1.0816
E13 Gable (insulation at rafter level)	8.2800	0.0800	0.6624
E18 Party wall between dwellings	10.5200	0.0600	0.6312
R6 Flat ceiling	18.1000	0.0600	1.0860

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	14.1324	(36)
Point Thermal bridges	(36a) = 0.0000	
Total fabric heat loss	(33) + (36) + (36a) = 66.5894	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	61.5060	61.1674	60.8355	59.2766	58.9849	57.6271	57.6271	57.3757	58.1501	58.9849	59.5749	60.1918	(38)
Heat transfer coeff	128.0954	127.7568	127.4249	125.8660	125.5743	124.2165	124.2165	123.9651	124.7395	125.5743	126.1644	126.7812	(39)

Average = Sum(39)m / 12 =	125.8646

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0653	1.0625	1.0598	1.0468	1.0444	1.0331	1.0331	1.0310	1.0374	1.0444	1.0493	1.0544	(40)
HLP (average)												1.0468	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.8642 (42)

Hot water usage for mixer showers

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

	31.1904	30.7271	30.0748	28.8721	27.9715	26.9729	26.4334	27.0812	27.7865	28.8550	30.0826	31.0849	(42b)

Hot water usage for other uses

	43.9627	42.3640	40.7654	39.1667	37.5681	35.9694	35.9694	37.5681	39.1667	40.7654	42.3640	43.9627	(42c)

Average daily hot water use (litres/day)	68.8844 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	75.1530	73.0911	70.8402	68.0388	65.5396	62.9423	62.4029	64.6493	66.9532	69.6204	72.4466	75.0476	(44)
Energy conte	119.0240	104.0808	108.8787	93.1417	88.2288	77.3949	75.4709	80.0493	82.5600	94.4742	103.2134	117.5064	(45)

Energy content (annual)	Total = Sum(45)m = 1144.0232
Distribution loss (46)m = 0.15 x (45)m	

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	101.1704	88.4687	92.5469	79.1705	74.9945	65.7857	64.1503	68.0419	70.1760	80.3031	87.7314	99.8804	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	101.1704	88.4687	92.5469	79.1705	74.9945	65.7857	64.1503	68.0419	70.1760	80.3031	87.7314	99.8804	(64)
									Total per year (kWh/year) = Sum(64)m =			972.4197	(64)
12Total per year (kWh/year)												972	(64)
Electric shower(s)													
	57.8551	51.5494	56.2900	53.7168	54.7248	52.2022	53.9422	54.7248	53.7168	56.2900	55.2315	57.8551	(64a)
								Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =				658.0987	(64a)
Heat gains from water heating, kWh/month													
	39.7564	35.0045	37.2092	33.2218	32.4298	29.4970	29.5231	30.6917	30.9732	34.1483	35.7407	39.4339	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	172.0807	190.5179	172.0807	177.8167	172.0807	177.8167	172.0807	172.0807	177.8167	172.0807	177.8167	172.0807	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	285.5253	288.4881	281.0218	265.1269	245.0625	226.2048	213.6066	210.6438	218.1101	234.0050	254.0694	272.9272	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	(71)
Water heating gains (Table 5)													
	53.4360	52.0901	50.0124	46.1414	43.5885	40.9680	39.6816	41.2523	43.0183	45.8982	49.6399	53.0025	(72)
Total internal gains													
	577.0055	597.0596	569.0784	555.0486	526.6952	510.9530	491.3324	489.9402	504.9086	517.9474	547.4895	563.9739	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	5.8000	19.6403	0.6300	0.7000	0.7700	34.8135	(76)
South	1.5400	46.7521	0.6300	0.7000	0.7700	22.0036	(78)
West	2.8100	19.6403	0.6300	0.7000	0.7700	16.8665	(80)

Solar gains	73.6836	137.1332	212.3961	294.7003	351.6474	356.6588	340.8555	298.4912	241.5893	158.8285	90.5206	61.5122	(83)
Total gains	650.6890	734.1928	781.4745	849.7489	878.3426	867.6118	832.1880	788.4314	746.4980	676.7759	638.0101	625.4861	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	20.1131	20.1664	20.2189	20.4694	20.5169	20.7412	20.7412	20.7832	20.6542	20.5169	20.4210	20.3216	
alpha	2.3409	2.3444	2.3479	2.3646	2.3678	2.3827	2.3827	2.3855	2.3769	2.3678	2.3614	2.3548	
util living area													
	0.9563	0.9406	0.9189	0.8706	0.7953	0.6730	0.5477	0.5845	0.7521	0.8859	0.9395	0.9599	(86)
MIT	17.9120	18.2155	18.6953	19.3933	20.0363	20.5645	20.8127	20.7741	20.3837	19.5494	18.6346	17.8723	(87)
Th 2	20.0292	20.0316	20.0338	20.0445	20.0465	20.0559	20.0559	20.0576	20.0523	20.0465	20.0425	20.0382	(88)
util rest of house													
	0.9508	0.9333	0.9083	0.8521	0.7623	0.6136	0.4581	0.4979	0.7020	0.8660	0.9308	0.9549	(89)
MIT 2	17.1872	17.4882	17.9633	18.6523	19.2692	19.7559	19.9567	19.9320	19.6023	18.8141	17.9132	17.1535	(90)
Living area fraction									fLA = Living area / (4) =			0.2917	(91)
MIT	17.3987	17.7004	18.1769	18.8685	19.4930	19.9918	20.2065	20.1777	19.8303	19.0287	18.1237	17.3632	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.3987	17.7004	18.1769	18.8685	19.4930	19.9918	20.2065	20.1777	19.8303	19.0287	18.1237	17.3632	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9304	0.9095	0.8816	0.8242	0.7400	0.6091	0.4735	0.5100	0.6885	0.8393	0.9073	0.9356	(94)
Useful gains	605.3998	667.7405	688.9567	700.3606	650.0141	528.4505	394.0583	402.0713	513.9309	568.0116	578.8676	585.2064	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1677.8811	1635.3408	1487.9284	1254.6971	978.6018	669.7524	447.9814	468.3001	714.7963	1058.4231	1390.7971	1668.8443	(97)
Space heating kWh													
	797.9261	650.2274	594.4349	399.1223	244.4692	0.0000	0.0000	0.0000	0.0000	364.8662	584.5892	806.2266	(98a)
Space heating requirement - total per year (kWh/year)												4441.8619	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	797.9261	650.2274	594.4349	399.1223	244.4692	0.0000	0.0000	0.0000	0.0000	364.8662	584.5892	806.2266	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4441.8619	
Space heating per m2											(98c) / (4) =	36.9416	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	1167.6354	919.2024	942.1347	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.6180	0.6911	0.6624	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	721.6029	635.2775	624.0389	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	922.8518	885.5034	838.0131	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	144.8992	186.1680	159.1969	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	36.2248	46.5420	39.7992	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												122.5660	(107)
Energy for space heating												36.9416	(99)
Energy for space cooling												1.0193	(108)
Total												37.9610	(109)
Fabric Energy Efficiency (TFEE)												38.0	(109)

Full SAP Calculation Printout

Property Reference	78449-08	**Issued on Date**	03/10/2025
Assessment Reference	001	**Prop Type Ref**	End
Property	840 Rochdale Road, MANCHESTER, M9 8FA		

SAP Rating	84 B	**DER**	3.34	**TER**	10.67
Environmental	97 A	**% DER < TER**			68.70
CO_2 Emissions (t/year)	0.38	**DFEE**	33.48	**TFEE**	37.96
Compliance Check	See BREL	**% DFEE < TFEE**			11.79
% DPER < TPER	36.93	**DPER**	35.29	**TPER**	55.95

Assessor Details	Mr. Daniel Goddard	**Assessor ID**	CP52-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.0600 (1b)	x	2.4800 (2b)	=	116.7088	(1b) - (3b)
First floor	49.7800 (1c)	x	2.7800 (2c)	=	138.3884	(1c) - (3c)
Second floor	23.4000 (1d)	x	2.7700 (2d)	=	64.8180	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	120.2400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	319.9152	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.2500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2125	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2709	0.2656	0.2603	0.2338	0.2284	0.2019	0.2019	0.1966	0.2125	0.2284	0.2391	0.2497	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	80.1000 (23c)

Effective ac	0.3704	0.3651	0.3598	0.3332	0.3279	0.3014	0.3014	0.2961	0.3120	0.3279	0.3386	0.3492	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door			4.1400	1.0000	4.1400			(26)
Window			10.1500	0.7752	7.8682			(27)
GF			47.0600	0.0900	4.2354	75.0000	3529.5000	(28a)
Exposed Floor			2.7200	0.1400	0.3808	20.0000	54.4000	(28b)
Main	129.1100	14.2900	114.8200	0.1300	14.9266	9.0000	1033.3800	(29a)
Dwarf Wall (PIRx0.72)	16.7700		16.7700	0.0900	1.5093	9.0000	150.9300	(29a)
PIJ	15.5100		15.5100	0.1300	2.0163	9.0000	139.5900	(30)
PIR	17.5400		17.5400	0.1300	2.2802	9.0000	157.8600	(30)
Residual Ceiling	26.3800		26.3800	0.0900	2.3742	9.0000	237.4200	(30)
Total net area of external elements Aum(A, m2)			255.0900					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		39.7310			(33)
Main dwelling								
Party Wall 1			47.6000	0.0000	0.0000	20.0000	952.0000	(32)

Timber	124.1700		9.0000	1117.5300 (32c)
FF	47.0600		18.0000	847.0800 (32d)
SF	23.4000		18.0000	421.2000 (32d)
GF	47.0600		9.0000	423.5400 (32e)
FF	23.4000		9.0000	210.6000 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 9275.0300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 77.1376 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	10.0000	0.1150	1.1500
E3 Sill	10.0000	0.0170	0.1700
E4 Jamb	33.0000	0.0940	3.1020
E5 Ground floor (normal)	20.0500	0.0670	1.3434
E11 Eaves (insulation at rafter level)	18.1000	0.0250	0.4525
E16 Corner (normal)	24.0800	0.0680	1.6374
E12 Gable (insulation at ceiling level)	5.6600	0.0770	0.4358
E6 Intermediate floor within a dwelling	39.5500	0.0320	1.2656
E17 Corner (inverted - internal area greater than external area)	2.4800	-0.0290	-0.0719
P1 Party wall - Ground floor	9.0500	0.3200	2.8960
E20 Exposed floor (normal)	3.3800	0.0790	0.2670
E21 Exposed floor (inverted)	3.3800	0.0630	0.2129
E13 Gable (insulation at rafter level)	8.2800	0.0740	0.6127
E18 Party wall between dwellings	10.5200	0.0920	0.9678
R6 Flat ceiling	18.1000	-0.0430	-0.7783

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 13.6630 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 53.3940 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	39.1078	38.5470	37.9861	35.1819	34.6210	31.8168	31.8168	31.2559	32.9385	34.6210	35.7427	36.8644	(38)
Heat transfer coeff	92.5019	91.9410	91.3802	88.5759	88.0150	85.2108	85.2108	84.6499	86.3325	88.0150	89.1368	90.2585	(39)
Average = Sum(39)m / 12 =												88.4357	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7693	0.7646	0.7600	0.7367	0.7320	0.7087	0.7087	0.7040	0.7180	0.7320	0.7413	0.7507	(40)
HLP (average)												0.7355	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.8642 (42)
Hot water usage for mixer showers

72.2437	71.1580	69.5759	66.5490	64.3151	61.8240	60.4080	61.9781	63.6992	66.3739	69.4659	71.9669	(42a)

Hot water usage for baths

31.1904	30.7271	30.0748	28.8721	27.9715	26.9729	26.4334	27.0812	27.7865	28.8550	30.0826	31.0849	(42b)

Hot water usage for other uses

43.9627	42.3640	40.7654	39.1667	37.5681	35.9694	35.9694	37.5681	39.1667	40.7654	42.3640	43.9627	(42c)

Average daily hot water use (litres/day) 135.4907 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	147.3967	144.2491	140.4161	134.5878	129.8547	124.7663	122.8109	126.6274	130.6524	135.9943	141.9125	147.0144	(44)
Energy conte	233.4403	205.4088	215.8143	184.2439	174.8094	153.4147	148.5292	156.7911	161.1075	184.5430	202.1803	230.1891	(45)
Energy content (annual)										Total = Sum(45)m =		2250.4717	
Distribution loss (46)m = 0.15 x (45)m	35.0160	30.8113	32.3722	27.6366	26.2214	23.0122	22.2794	23.5187	24.1661	27.6815	30.3271	34.5284	(46)
Water storage loss:													
Store volume												210.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5800	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8532	(55)
Total storage loss	26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(56)
If cylinder contains dedicated solar storage	26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	283.1519	250.3096	265.5259	232.3519	224.5210	201.5227	198.2408	206.5027	209.2155	234.2546	250.2883	279.9007	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	283.1519	250.3096	265.5259	232.3519	224.5210	201.5227	198.2408	206.5027	209.2155	234.2546	250.2883	279.9007	(64)
										Total per year (kWh/year) = Sum(64)m =		2835.7857	(64)
12Total per year (kWh/year)												2836	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	117.3882	104.2191	111.5276	99.7475	97.8934	89.4968	89.1552	91.9023	92.0546	101.1298	105.7114	116.3071	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	176.3741	195.2713	176.3741	182.2532	176.3741	182.2532	176.3741	176.3741	182.2532	176.3741	182.2532	176.3741	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	285.5253	288.4881	281.0218	265.1269	245.0625	226.2048	213.6066	210.6438	218.1101	234.0050	254.0694	272.9272	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	(71)
Water heating gains (Table 5)	157.7798	155.0879	149.9026	138.5382	131.5771	124.3011	119.8323	123.5246	127.8537	135.9272	146.8213	156.3268	(72)
Total internal gains	685.6427	704.8109	673.2621	651.8819	618.9773	598.7226	575.7765	576.5060	594.1805	612.2698	649.1075	671.5916	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	5.8000	19.6403	0.3000	0.0000	0.7700	26.3140	(76)
South	1.5400	46.7521	0.3000	0.0000	0.7700	16.6316	(78)
West	2.8100	19.6403	0.3000	0.0000	0.7700	12.7487	(80)

Solar gains	55.6943	103.6532	160.5412	222.7516	265.7955	269.5834	257.6383	225.6169	182.6072	120.0518	68.4207	46.4945	(83)
Total gains	741.3370	808.4641	833.8033	874.6335	884.7727	868.3060	833.4149	802.1229	776.7877	732.3216	717.5282	718.0861	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	27.8524	28.0223	28.1943	29.0869	29.2722	30.2356	30.2356	30.4359	29.8427	29.2722	28.9039	28.5447	
alpha	2.8568	2.8682	2.8796	2.9391	2.9515	3.0157	3.0157	3.0291	2.9895	2.9515	2.9269	2.9030	
util living area	0.9321	0.9114	0.8829	0.8163	0.7172	0.5601	0.4267	0.4559	0.6431	0.8233	0.9036	0.9364	(86)
Living	19.0181	19.2704	19.6270	20.1563	20.5652	20.8590	20.9538	20.9431	20.7712	20.2617	19.6105	19.0235	
Non living	18.4411	18.6912	19.0436	19.5700	19.9570	20.2331	20.3069	20.3037	20.1548	19.6795	19.0428	18.4580	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	19.9861	19.2704	19.6270	20.1563	20.5652	20.8590	20.9538	20.9431	20.7712	20.2617	19.6105	19.3000	(87)
Th 2	20.2800	20.2841	20.2881	20.3086	20.3127	20.3332	20.3332	20.3373	20.3250	20.3127	20.3045	20.2963	(88)
util rest of house	0.9254	0.9027	0.8710	0.7972	0.6867	0.5144	0.3685	0.3980	0.5998	0.8015	0.8930	0.9301	(89)
MIT 2	19.3393	18.6912	19.0436	19.5700	19.9570	20.2331	20.3069	20.3037	20.1548	19.6795	19.0428	18.7151	(90)
Living area fraction										fLA = Living area / (4) =		0.2917	(91)
MIT	19.5280	18.8602	19.2138	19.7411	20.1344	20.4157	20.4956	20.4902	20.3347	19.8494	19.2084	18.8857	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5280	18.8602	19.2138	19.7411	20.1344	20.4157	20.4956	20.4902	20.3347	19.8494	19.2084	18.8857	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9173	0.8819	0.8500	0.7799	0.6782	0.5203	0.3830	0.4117	0.6005	0.7850	0.8730	0.9149	(94)
Useful gains	680.0646	713.0175	708.6990	682.0895	600.0373	451.7541	319.1930	330.2521	466.4299	574.8696	626.3767	656.9742	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1408.6182	1283.5144	1161.7895	960.2573	742.3553	495.5608	331.9489	346.2389	538.2549	814.0835	1079.3070	1325.5116	(97)
Space heating kWh	542.0439	383.3739	337.0994	200.2808	105.8846	0.0000	0.0000	0.0000	0.0000	177.9752	326.1099	497.3918	(98a)
Space heating requirement - total per year (kWh/year)												2570.1594	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	542.0439	383.3739	337.0994	200.2808	105.8846	0.0000	0.0000	0.0000	0.0000	177.9752	326.1099	497.3918	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2570.1594	
Space heating per m2											(98c) / (4) =	21.3752	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	281.1500	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	542.0439	383.3739	337.0994	200.2808	105.8846	0.0000	0.0000	0.0000	0.0000	177.9752	326.1099	497.3918	(98)
Space heating efficiency (main heating system 1)	281.1500	281.1500	281.1500	281.1500	281.1500	0.0000	0.0000	0.0000	0.0000	281.1500	281.1500	281.1500	(210)
Space heating fuel (main heating system)	192.7952	136.3592	119.9002	71.2363	37.6612	0.0000	0.0000	0.0000	0.0000	63.3026	115.9914	176.9133	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	283.1519	250.3096	265.5259	232.3519	224.5210	201.5227	198.2408	206.5027	209.2155	234.2546	250.2883	279.9007	(64)
Efficiency of water heater												279.7133	(216)
(217)m	279.7133	279.7133	279.7133	279.7133	279.7133	279.7133	279.7133	279.7133	279.7133	279.7133	279.7133	279.7133	(217)
Fuel for water heating, kWh/month	101.2293	89.4879	94.9279	83.0679	80.2683	72.0462	70.8728	73.8266	74.7964	83.7481	89.4803	100.0670	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	45.0156	40.6593	45.0156	43.5635	45.0156	43.5635	45.0156	45.0156	43.5635	45.0156	43.5635	45.0156	(231)
Lighting	37.1610	29.8119	26.8423	19.6658	15.1905	12.4107	13.8573	18.0122	23.3960	30.6969	34.6720	38.1938	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													

(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	914.1594	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	279.7133	
Water heating fuel used	1013.8188	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.3580)		
mechanical ventilation fans (SFP = 1.3580)	530.0227	(230a)
Total electricity for the above, kWh/year	530.0227	(231)
Electricity for lighting (calculated in Appendix L)	299.9105	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2757.9114	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	914.1594	0.1550	141.7066	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1013.8188	0.1410	142.9349	(264)
Space and water heating			284.6415	(265)
Pumps, fans and electric keep-hot	530.0227	0.1387	73.5207	(267)
Energy for lighting	299.9105	0.1443	43.2864	(268)
Total CO2, kg/year			401.4486	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.3400	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	914.1594	1.5739	1438.7660	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1013.8188	1.5213	1542.3447	(278)
Space and water heating			2981.1107	(279)
Pumps, fans and electric keep-hot	530.0227	1.5128	801.8183	(281)
Energy for lighting	299.9105	1.5338	460.0128	(282)
Total Primary energy kWh/year			4242.9418	(286)
Dwelling Primary energy Rate (DPER)			35.2900	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)			Volume (m3)	
Main dwelling							
Ground floor	47.0600	(1b)	x 2.4800	(2b)	=	116.7088	(1b) - (3b)
First floor	49.7800	(1c)	x 2.7800	(2c)	=	138.3884	(1c) - (3c)
Second floor	23.4000	(1d)	x 2.7700	(2d)	=	64.8180	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	120.2400						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)		=	319.9152	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	4 * 10 =	40.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1250	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	

Measured/design AP50	5.0000	(17)
Infiltration rate	0.3750	(18)
Number of sides sheltered	2	(19)
Shelter factor (20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) =	0.3188	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4064	0.3985	0.3905	0.3507	0.3427	0.3028	0.3028	0.2949	0.3188	0.3427	0.3586	0.3746	(22b)
Effective ac	0.5826	0.5794	0.5762	0.5615	0.5587	0.5459	0.5459	0.5435	0.5508	0.5587	0.5643	0.5701	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			4.1400	1.0000	4.1400			(26)
TER Opening Type			10.1500	1.1450	11.6221			(27)
GF			47.0600	0.1300	6.1178			(28a)
Exposed Floor			2.7200	0.1300	0.3536			(28b)
Main	129.1100	14.2900	114.8200	0.1800	20.6676			(29a)
Dwarf Wall (PIRx0.72)	16.7700		16.7700	0.1800	3.0186			(29a)
PIJ	15.5100		15.5100	0.1100	1.7061			(30)
PIR	17.5400		17.5400	0.1100	1.9294			(30)
Residual Ceiling	26.3800		26.3800	0.1100	2.9018			(30)
Total net area of external elements Aum(A, m2)			255.0900					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		52.4570			(33)
Main dwelling								
Party Wall 1			47.6000	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	77.1376	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	10.0000	0.0500	0.5000
E3 Sill	10.0000	0.0500	0.5000
E4 Jamb	33.0000	0.0500	1.6500
E5 Ground floor (normal)	20.0500	0.1600	3.2080
E11 Eaves (insulation at rafter level)	18.1000	0.0400	0.7240
E16 Corner (normal)	24.0800	0.0900	2.1672
E12 Gable (insulation at ceiling level)	5.6600	0.0600	0.3396
E6 Intermediate floor within a dwelling	39.5500	0.0000	0.0000
E17 Corner (inverted - internal area greater than external area)	2.4800	-0.0900	-0.2232
P1 Party wall - Ground floor	9.0500	0.0800	0.7240
E20 Exposed floor (normal)	3.3800	0.3200	1.0816
E21 Exposed floor (inverted)	3.3800	0.3200	1.0816
E13 Gable (insulation at rafter level)	8.2800	0.0800	0.6624
E18 Party wall between dwellings	10.5200	0.0600	0.6312
R6 Flat ceiling	18.1000	0.0600	1.0860

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	14.1324	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	66.5894	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	61.5060	61.1674	60.8355	59.2766	58.9849	57.6271	57.6271	57.3757	58.1501	58.9849	59.5749	60.1918	(38)
Heat transfer coeff	128.0954	127.7568	127.4249	125.8660	125.5743	124.2165	124.2165	123.9651	124.7395	125.5743	126.1644	126.7812	(39)
Average = Sum(39)m / 12 =												125.8646	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0653	1.0625	1.0598	1.0468	1.0444	1.0331	1.0331	1.0310	1.0374	1.0444	1.0493	1.0544	(40)
HLP (average)												1.0468	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.8642	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	72.2437	71.1580	69.5759	66.5490	64.3151	61.8240	60.4080	61.9781	63.6992	66.3739	69.4659	71.9669	(42a)
Hot water usage for baths	31.1904	30.7271	30.0748	28.8721	27.9715	26.9729	26.4334	27.0812	27.7865	28.8550	30.0826	31.0849	(42b)
Hot water usage for other uses	43.9627	42.3640	40.7654	39.1667	37.5681	35.9694	35.9694	37.5681	39.1667	40.7654	42.3640	43.9627	(42c)
Average daily hot water use (litres/day)												135.4907	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	147.3967	144.2491	140.4161	134.5878	129.8547	124.7663	122.8109	126.6274	130.6524	135.9943	141.9125	147.0144	(44)
Energy conte	233.4403	205.4088	215.8143	184.2439	174.8094	153.4147	148.5292	156.7911	161.1075	184.5430	202.1803	230.1891	(45)
Energy content (annual)										Total = Sum(45)m =		2250.4717	
Distribution loss (46)m = 0.15 x (45)m	35.0160	30.8113	32.3722	27.6366	26.2214	23.0122	22.2794	23.5187	24.1661	27.6815	30.3271	34.5284	(46)

Water storage loss:		
Store volume	210.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):	1.7016	(48)
Temperature factor from Table 2b	0.5400	(49)
Enter (49) or (54) in (55)	0.9188	(55)

Total storage loss	28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842	(56)
If cylinder contains dedicated solar storage	28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	285.1869	252.1477	267.5609	234.3213	226.5560	203.4920	200.2757	208.5377	211.1848	236.2896	252.2577	281.9357	(62)
WWHRS	-33.0268	-29.2092	-30.5861	-25.3265	-23.6034	-20.1976	-18.9320	-20.1323	-20.8972	-24.6355	-27.9091	-32.4152	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	252.1601	222.9385	236.9748	208.9947	202.9525	183.2944	181.3437	188.4054	190.2876	211.6541	224.3486	249.5205	(64)

Total per year (kWh/year) = Sum(64)m = 2552.8750 (64)

12Total per year (kWh/year) 2553 (64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

119.0162	105.6895	113.1555	101.3230	99.5214	91.0723	90.7832	93.5303	93.6301	102.7578	107.2868	117.9351	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

172.0807	190.5179	172.0807	177.8167	172.0807	177.8167	172.0807	172.0807	177.8167	172.0807	177.8167	172.0807	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

285.5253	288.4881	281.0218	265.1269	245.0625	226.2048	213.6066	210.6438	218.1101	234.0050	254.0694	272.9272	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	(69)

Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	(71)

Water heating gains (Table 5)

159.9680	157.2761	152.0908	140.7264	133.7653	126.4893	122.0205	125.7128	130.0418	138.1154	149.0095	158.5150	(72)

Total internal gains

686.5375	705.2456	674.1568	652.6335	619.8720	596.4742	573.6713	574.4008	591.9321	613.1645	649.8591	672.4863	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	5.8000	19.6403	0.6300	0.7000	0.7700	34.8135	(76)
South	1.5400	46.7521	0.6300	0.7000	0.7700	22.0036	(78)
West	2.8100	19.6403	0.6300	0.7000	0.7700	16.8665	(80)

Solar gains	73.6836	137.1332	212.3961	294.7003	351.6474	356.6588	340.8555	298.4912	241.5893	158.8285	90.5206	61.5122	(83)
Total gains	760.2210	842.3788	886.5529	947.3339	971.5194	953.1331	914.5268	872.8920	833.5215	771.9930	740.3797	733.9985	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	20.1131	20.1664	20.2189	20.4694	20.5169	20.7412	20.7412	20.7832	20.6542	20.5169	20.4210	20.3216	
alpha	2.3409	2.3444	2.3479	2.3646	2.3678	2.3827	2.3827	2.3855	2.3769	2.3678	2.3614	2.3548	
util living area													
	0.9409	0.9233	0.8986	0.8458	0.7647	0.6383	0.5121	0.5458	0.7151	0.8581	0.9202	0.9451	(86)
MIT	18.1015	18.3932	18.8555	19.5194	20.1273	20.6149	20.8386	20.8063	20.4549	19.6785	18.8023	18.0631	(87)
Th 2	20.0292	20.0316	20.0338	20.0445	20.0465	20.0559	20.0559	20.0576	20.0523	20.0465	20.0425	20.0382	(88)
util rest of house													
	0.9339	0.9142	0.8858	0.8249	0.7293	0.5779	0.4249	0.4607	0.6622	0.8348	0.9092	0.9386	(89)
MIT 2	16.6207	16.9900	17.5748	18.4092	19.1516	19.7198	19.9480	19.9218	19.5488	18.6190	17.5187	16.5770	(90)
Living area fraction									fLA = Living area / (4) =			0.2917	(91)
MIT	17.0527	17.3993	17.9484	18.7331	19.4363	19.9809	20.2079	20.1798	19.8131	18.9281	17.8932	17.0105	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.0527	17.3993	17.9484	18.7331	19.4363	19.9809	20.2079	20.1798	19.8131	18.9281	17.8932	17.0105	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9033	0.8804	0.8498	0.7898	0.7031	0.5726	0.4399	0.4726	0.6470	0.8007	0.8757	0.9092	(94)
Useful gains	686.6911	741.6588	753.4184	748.2414	683.0305	545.7514	402.2772	412.5475	539.3193	618.1397	648.3868	667.3711	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1633.5676	1596.8759	1458.8160	1237.6549	971.4757	668.4000	448.1570	468.5684	712.6527	1045.7950	1361.7205	1624.1356	(97)
Space heating kWh													
	704.4762	574.7058	524.8158	352.3777	214.6032	0.0000	0.0000	0.0000	0.0000	318.1755	513.6003	711.8328	(98a)

Space heating requirement - total per year (kWh/year) 3914.5874

Solar heating kWh

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)

Solar heating contribution - total per year (kWh/year) 0.0000

Space heating kWh

704.4762	574.7058	524.8158	352.3777	214.6032	0.0000	0.0000	0.0000	0.0000	318.1755	513.6003	711.8328	(98c)

Space heating requirement after solar contribution - total per year (kWh/year) 3914.5874

Space heating per m2 (98c) / (4) = 32.5564 (99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (201)

Fraction of space heat from main system(s) 1.0000 (202)

Efficiency of main space heating system 1 (in %) 92.3000 (206)

Efficiency of main space heating system 2 (in %) 0.0000 (207)

Efficiency of secondary/supplementary heating system, % 0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	704.4762	574.7058	524.8158	352.3777	214.6032	0.0000	0.0000	0.0000	0.0000	318.1755	513.6003	711.8328	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	763.2461	622.6499	568.5979	381.7743	232.5062	0.0000	0.0000	0.0000	0.0000	344.7188	556.4467	771.2164	(211)

Space heating efficiency (main heating system 2)												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating												
Water heating requirement												
252.1601	222.9385	236.9748	208.9947	202.9525	183.2944	181.3437	188.4054	190.2876	211.6541	224.3486	249.5205	(64)
Efficiency of water heater												
(217)m											79.8000	(216)
86.2363	86.0864	85.7902	85.2217	84.1852	79.8000	79.8000	79.8000	79.8000	84.9717	85.8562	86.2745	(217)
Fuel for water heating, kWh/month												
292.4058	258.9707	276.2261	245.2365	241.0787	229.6923	227.2477	236.0970	238.4556	249.0877	261.3074	289.2169	(219)
Space cooling fuel requirement												
(221)m												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa												
7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting												
35.7550	28.6840	25.8267	18.9218	14.6157	11.9412	13.3329	17.3307	22.5108	29.5354	33.3602	36.7487	(232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m												
-44.8214	-63.5741	-91.8759	-103.8097	-112.2843	-104.8534	-103.5347	-97.5996	-87.1465	-72.9414	-49.4069	-38.7036	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m												
-24.0837	-50.8309	-101.3709	-152.7629	-202.5163	-203.7346	-201.3618	-170.2556	-124.4628	-72.8823	-32.2119	-19.0333	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	4241.1564	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	3045.0225	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	288.5630	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-2326.0585	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	5334.6834	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	4241.1564	0.2100	890.6428	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3045.0225	0.2100	639.4547	(264)
Space and water heating			1530.0976	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	288.5630	0.1443	41.6486	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-970.5514	0.1345	-130.5280	
PV Unit electricity exported	-1355.5071	0.1258	-170.5125	
Total			-301.0405	(269)
Total CO2, kg/year			1282.6349	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.6700	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	4241.1564	1.1300	4792.5067	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3045.0225	1.1300	3440.8754	(278)
Space and water heating			8233.3821	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	288.5630	1.5338	442.6076	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-970.5514	1.4970	-1452.9558	
PV Unit electricity exported	-1355.5071	0.4617	-625.8906	
Total			-2078.8465	(283)
Total Primary energy kWh/year			6727.2440	(286)
Target Primary Energy Rate (TPER)			55.9500	(287)

Full SAP Calculation Printout

Property Reference	78449-08	**Issued on Date**	03/10/2025
Assessment Reference	001	**Prop Type Ref**	End
Property	840 Rochdale Road, MANCHESTER, M9 8FA		

SAP Rating	84 B	**DER**	3.34	**TER**	10.67
Environmental	97 A	**% DER < TER**			68.70
CO_2 Emissions (t/year)	0.38	**DFEE**	33.48	**TFEE**	37.96
Compliance Check	See BREL	**% DFEE < TFEE**			11.79
% DPER < TPER	36.93	**DPER**	35.29	**TPER**	55.95

Assessor Details	Mr. Daniel Goddard	**Assessor ID**	CP52-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.0600 (1b)	x	2.4800 (2b)	=	116.7088	(1b) - (3b)
First floor	49.7800 (1c)	x	2.7800 (2c)	=	138.3884	(1c) - (3c)
Second floor	23.4000 (1d)	x	2.7700 (2d)	=	64.8180	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	120.2400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	319.9152	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.2500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2125	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2709	0.2656	0.2603	0.2338	0.2284	0.2019	0.2019	0.1966	0.2125	0.2284	0.2391	0.2497	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	80.1000 (23c)

Effective ac	0.3704	0.3651	0.3598	0.3332	0.3279	0.3014	0.3014	0.2961	0.3120	0.3279	0.3386	0.3492	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door			4.1400	1.0000	4.1400			(26)
Window			10.1500	0.7752	7.8682			(27)
GF			47.0600	0.0900	4.2354	75.0000	3529.5000	(28a)
Exposed Floor			2.7200	0.1400	0.3808	20.0000	54.4000	(28b)
Main	129.1100	14.2900	114.8200	0.1300	14.9266	9.0000	1033.3800	(29a)
Dwarf Wall (PIRx0.72)	16.7700		16.7700	0.0900	1.5093	9.0000	150.9300	(29a)
PIJ	15.5100		15.5100	0.1300	2.0163	9.0000	139.5900	(30)
PIR	17.5400		17.5400	0.1300	2.2802	9.0000	157.8600	(30)
Residual Ceiling	26.3800		26.3800	0.0900	2.3742	9.0000	237.4200	(30)
Total net area of external elements Aum(A, m2)			255.0900					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		39.7310			(33)
Main dwelling								
Party Wall 1			47.6000	0.0000	0.0000	20.0000	952.0000	(32)

Timber	124.1700		9.0000	1117.5300 (32c)
FF	47.0600		18.0000	847.0800 (32d)
SF	23.4000		18.0000	421.2000 (32d)
GF	47.0600		9.0000	423.5400 (32e)
FF	23.4000		9.0000	210.6000 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 9275.0300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 77.1376 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	10.0000	0.1150	1.1500
E3 Sill	10.0000	0.0170	0.1700
E4 Jamb	33.0000	0.0940	3.1020
E5 Ground floor (normal)	20.0500	0.0670	1.3434
E11 Eaves (insulation at rafter level)	18.1000	0.0250	0.4525
E16 Corner (normal)	24.0800	0.0680	1.6374
E12 Gable (insulation at ceiling level)	5.6600	0.0770	0.4358
E6 Intermediate floor within a dwelling	39.5500	0.0320	1.2656
E17 Corner (inverted - internal area greater than external area)	2.4800	-0.0290	-0.0719
P1 Party wall - Ground floor	9.0500	0.3200	2.8960
E20 Exposed floor (normal)	3.3800	0.0790	0.2670
E21 Exposed floor (inverted)	3.3800	0.0630	0.2129
E13 Gable (insulation at rafter level)	8.2800	0.0740	0.6127
E18 Party wall between dwellings	10.5200	0.0920	0.9678
R6 Flat ceiling	18.1000	-0.0430	-0.7783

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 13.6630 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 53.3940 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	39.1078	38.5470	37.9861	35.1819	34.6210	31.8168	31.8168	31.2559	32.9385	34.6210	35.7427	36.8644	(38)
Heat transfer coeff	92.5019	91.9410	91.3802	88.5759	88.0150	85.2108	85.2108	84.6499	86.3325	88.0150	89.1368	90.2585	(39)
Average = Sum(39)m / 12 =												88.4357	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7693	0.7646	0.7600	0.7367	0.7320	0.7087	0.7087	0.7040	0.7180	0.7320	0.7413	0.7507	(40)
HLP (average)												0.7355	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.8642 (42)
Hot water usage for mixer showers

72.2437	71.1580	69.5759	66.5490	64.3151	61.8240	60.4080	61.9781	63.6992	66.3739	69.4659	71.9669	(42a)

Hot water usage for baths

31.1904	30.7271	30.0748	28.8721	27.9715	26.9729	26.4334	27.0812	27.7865	28.8550	30.0826	31.0849	(42b)

Hot water usage for other uses

43.9627	42.3640	40.7654	39.1667	37.5681	35.9694	35.9694	37.5681	39.1667	40.7654	42.3640	43.9627	(42c)

Average daily hot water use (litres/day) 135.4907 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	147.3967	144.2491	140.4161	134.5878	129.8547	124.7663	122.8109	126.6274	130.6524	135.9943	141.9125	147.0144	(44)
Energy conte	233.4403	205.4088	215.8143	184.2439	174.8094	153.4147	148.5292	156.7911	161.1075	184.5430	202.1803	230.1891	(45)
Energy content (annual)										Total = Sum(45)m =		2250.4717	
Distribution loss (46)m = 0.15 x (45)m	35.0160	30.8113	32.3722	27.6366	26.2214	23.0122	22.2794	23.5187	24.1661	27.6815	30.3271	34.5284	(46)
Water storage loss:													
Store volume												210.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5800	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8532	(55)
Total storage loss	26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(56)
If cylinder contains dedicated solar storage	26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	283.1519	250.3096	265.5259	232.3519	224.5210	201.5227	198.2408	206.5027	209.2155	234.2546	250.2883	279.9007	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	283.1519	250.3096	265.5259	232.3519	224.5210	201.5227	198.2408	206.5027	209.2155	234.2546	250.2883	279.9007	(64)
										Total per year (kWh/year) = Sum(64)m =		2835.7857	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	117.3882	104.2191	111.5276	99.7475	97.8934	89.4968	89.1552	91.9023	92.0546	101.1298	105.7114	116.3071	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	42.4554	37.7085	30.6667	23.2166	17.3547	14.6516	15.8315	20.5784	27.6203	35.0704	40.9323	43.6354	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	426.1571	430.5793	419.4356	395.7119	365.7649	337.6190	318.8159	314.3937	325.5374	349.2611	379.2081	407.3540	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	(71)
Water heating gains (Table 5)	157.7798	155.0879	149.9026	138.5382	131.5771	124.3011	119.8323	123.5246	127.8537	135.9272	146.8213	156.3268	(72)
Total internal gains	738.7268	735.7102	712.3392	669.8011	627.0312	588.9061	566.8141	570.8312	593.3458	632.5931	679.2961	719.6506	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	5.8000	19.6403	0.3000	0.0000	0.7700	26.3140	(76)
South	1.5400	46.7521	0.3000	0.0000	0.7700	16.6316	(78)
West	2.8100	19.6403	0.3000	0.0000	0.7700	12.7487	(80)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	55.6943	103.6532	160.5412	222.7516	265.7955	269.5834	257.6383	225.6169	182.6072	120.0518	68.4207	46.4945	(83)
Total gains	794.4211	839.3634	872.8805	892.5527	892.8266	858.4895	824.4524	796.4481	775.9530	752.6449	747.7168	766.1451	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	27.8524	28.0223	28.1943	29.0869	29.2722	30.2356	30.2356	30.4359	29.8427	29.2722	28.9039	28.5447	
alpha	2.8568	2.8682	2.8796	2.9391	2.9515	3.0157	3.0157	3.0291	2.9895	2.9515	2.9269	2.9030	
util living area	0.9213	0.9043	0.8721	0.8099	0.7136	0.5649	0.4307	0.4586	0.6435	0.8148	0.8951	0.9267	(86)
Living	19.1129	19.3220	19.6854	20.1773	20.5713	20.8556	20.9526	20.9422	20.7708	20.2860	19.6597	19.1114	
Non living	18.5335	18.7412	19.0994	19.5893	19.9623	20.2306	20.3062	20.3031	20.1545	19.7017	19.0901	18.5438	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.0346	19.3220	19.6854	20.1773	20.5713	20.8556	20.9526	20.9422	20.7708	20.2860	19.6597	19.3756	(87)
Th 2	20.2800	20.2841	20.2881	20.3086	20.3127	20.3332	20.3332	20.3373	20.3250	20.3127	20.3045	20.2963	(88)
util rest of house	0.9136	0.8950	0.8594	0.7904	0.6830	0.5191	0.3721	0.4005	0.6003	0.7923	0.8838	0.9196	(89)
MIT 2	19.3865	18.7412	19.0994	19.5893	19.9623	20.2306	20.3062	20.3031	20.1545	19.7017	19.0901	18.7889	(90)
Living area fraction										fLA = Living area / (4) =		0.2917	(91)
MIT	19.5756	18.9106	19.2703	19.7609	20.1400	20.4130	20.4948	20.4896	20.3343	19.8722	19.2563	18.9601	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5756	18.9106	19.2703	19.7609	20.1400	20.4130	20.4948	20.4896	20.3343	19.8722	19.2563	18.9601	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9052	0.8740	0.8384	0.7734	0.6748	0.5248	0.3867	0.4142	0.6009	0.7763	0.8636	0.9036	(94)
Useful gains	719.1374	733.5805	731.8195	690.2827	602.4448	450.5018	318.7873	329.9274	466.2604	584.2892	645.7097	692.2896	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1413.0241	1288.1513	1166.9560	962.0108	742.8463	495.3273	331.8760	346.1804	538.2220	816.0931	1083.5693	1332.2224	(97)
Space heating kWh	516.2517	372.6716	323.7415	195.6442	104.4587	0.0000	0.0000	0.0000	0.0000	172.4620	315.2590	476.1100	(98a)
Space heating requirement - total per year (kWh/year)												2476.5988	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	516.2517	372.6716	323.7415	195.6442	104.4587	0.0000	0.0000	0.0000	0.0000	172.4620	315.2590	476.1100	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2476.5988	
Space heating per m2											(98c) / (4) =	20.5971	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	281.1500	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	516.2517	372.6716	323.7415	195.6442	104.4587	0.0000	0.0000	0.0000	0.0000	172.4620	315.2590	476.1100	(98)
Space heating efficiency (main heating system 1)	281.1500	281.1500	281.1500	281.1500	281.1500	0.0000	0.0000	0.0000	0.0000	281.1500	281.1500	281.1500	(210)
Space heating fuel (main heating system)	183.6214	132.5526	115.1490	69.5871	37.1541	0.0000	0.0000	0.0000	0.0000	61.3416	112.1319	169.3437	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	283.1519	250.3096	265.5259	232.3519	224.5210	201.5227	198.2408	206.5027	209.2155	234.2546	250.2883	279.9007	(64)
Efficiency of water heater												279.7133	(216)
(217)m	279.7133	279.7133	279.7133	279.7133	279.7133	279.7133	279.7133	279.7133	279.7133	279.7133	279.7133	279.7133	(217)
Fuel for water heating, kWh/month	101.2293	89.4879	94.9279	83.0679	80.2683	72.0462	70.8728	73.8266	74.7964	83.7481	89.4803	100.0670	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	45.0156	40.6593	45.0156	43.5635	45.0156	43.5635	45.0156	45.0156	43.5635	45.0156	43.5635	45.0156	(231)
Lighting	37.1610	29.8119	26.8423	19.6658	15.1905	12.4107	13.8573	18.0122	23.3960	30.6969	34.6720	38.1938	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)

Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	880.8815	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	279.7133	
Water heating fuel used	1013.8188	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.3580)		
mechanical ventilation fans (SFP = 1.3580)	530.0227	(230a)
Total electricity for the above, kWh/year	530.0227	(231)
Electricity for lighting (calculated in Appendix L)	299.9105	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2724.6336	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	880.8815	16.4900	145.2574	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1013.8188	16.4900	167.1787	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	530.0227	16.4900	87.4007	(249)
Energy for lighting	299.9105	16.4900	49.4552	(250)
Additional standing charges			0.0000	(251)
Total energy cost			449.2921	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.9788	(257)
SAP value		84.1328	
SAP rating (Section 12)		84	(258)
SAP band		B	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	880.8815	0.1549	136.4892	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1013.8188	0.1410	142.9349	(264)
Space and water heating			279.4241	(265)
Pumps, fans and electric keep-hot	530.0227	0.1387	73.5207	(267)
Energy for lighting	299.9105	0.1443	43.2864	(268)
Total CO2, kg/year			396.2312	(272)
CO2 emissions per m2			3.3000	(273)
EI value			96.7868	
EI rating			97	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.0600	(1b) x	2.4800	(2b) =	116.7088	(1b) - (3b)
First floor	49.7800	(1c) x	2.7800	(2c) =	138.3884	(1c) - (3c)
Second floor	23.4000	(1d) x	2.7700	(2d) =	64.8180	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	120.2400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		319.9152	(5)

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2. Ventilation rate

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m3 per hour

Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.2500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2125	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.6000	4.5000	4.5000	4.1000	4.2000	3.7000	3.5000	3.5000	3.7000	4.1000	4.1000	4.2000	(22)
Wind factor	1.1500	1.1250	1.1250	1.0250	1.0500	0.9250	0.8750	0.8750	0.9250	1.0250	1.0250	1.0500	(22a)
Adj infilt rate	0.2444	0.2391	0.2391	0.2178	0.2231	0.1966	0.1859	0.1859	0.1966	0.2178	0.2178	0.2231	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =		80.1000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.3439	0.3386	0.3386	0.3173	0.3226	0.2961	0.2854	0.2854	0.2961	0.3173	0.3173	0.3226	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door			4.1400	1.0000	4.1400			(26)
Window			10.1500	0.7752	7.8682			(27)
GF			47.0600	0.0900	4.2354	75.0000	3529.5000	(28a)
Exposed Floor			2.7200	0.1400	0.3808	20.0000	54.4000	(28b)
Main	129.1100	14.2900	114.8200	0.1300	14.9266	9.0000	1033.3800	(29a)
Dwarf Wall (PIRx0.72)	16.7700		16.7700	0.0900	1.5093	9.0000	150.9300	(29a)
PIJ	15.5100		15.5100	0.1300	2.0163	9.0000	139.5900	(30)
PIR	17.5400		17.5400	0.1300	2.2802	9.0000	157.8600	(30)
Residual Ceiling	26.3800		26.3800	0.0900	2.3742	9.0000	237.4200	(30)
Total net area of external elements Aum(A, m2)			255.0900					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		39.7310			(33)
Main dwelling								
Party Wall 1			47.6000	0.0000	0.0000	20.0000	952.0000	(32)
Timber			124.1700			9.0000	1117.5300	(32c)
FF			47.0600			18.0000	847.0800	(32d)
SF			23.4000			18.0000	421.2000	(32d)
GF			47.0600			9.0000	423.5400	(32e)
FF			23.4000			9.0000	210.6000	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	9275.0300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		77.1376 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	10.0000	0.1150	1.1500
E3 Sill	10.0000	0.0170	0.1700
E4 Jamb	33.0000	0.0940	3.1020
E5 Ground floor (normal)	20.0500	0.0670	1.3434
E11 Eaves (insulation at rafter level)	18.1000	0.0250	0.4525
E16 Corner (normal)	24.0800	0.0680	1.6374
E12 Gable (insulation at ceiling level)	5.6600	0.0770	0.4358
E6 Intermediate floor within a dwelling	39.5500	0.0320	1.2656
E17 Corner (inverted - internal area greater than external area)	2.4800	-0.0290	-0.0719
P1 Party wall - Ground floor	9.0500	0.3200	2.8960
E20 Exposed floor (normal)	3.3800	0.0790	0.2670
E21 Exposed floor (inverted)	3.3800	0.0630	0.2129
E13 Gable (insulation at rafter level)	8.2800	0.0740	0.6127
E18 Party wall between dwellings	10.5200	0.0920	0.9678
R6 Flat ceiling	18.1000	-0.0430	-0.7783

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		13.6630 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	53.3940 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	36.3036	35.7427	35.7427	33.4993	34.0602	31.2559	30.1342	30.1342	31.2559	33.4993	33.4993	34.0602	(38)
Heat transfer coeff	89.6976	89.1368	89.1368	86.8933	87.4542	84.6499	83.5282	83.5282	84.6499	86.8933	86.8933	87.4542	(39)
Average = Sum(39)m / 12 =												86.6597	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7460	0.7413	0.7413	0.7227	0.7273	0.7040	0.6947	0.6947	0.7040	0.7227	0.7227	0.7273	(40)
HLP (average)												0.7207	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.8642 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
72.2437	71.1580	69.5759	66.5490	64.3151	61.8240	60.4080	61.9781	63.6992	66.3739	69.4659	71.9669	(42a)

Hot water usage for baths

31.1904	30.7271	30.0748	28.8721	27.9715	26.9729	26.4334	27.0812	27.7865	28.8550	30.0826	31.0849	(42b)

Hot water usage for other uses

43.9627	42.3640	40.7654	39.1667	37.5681	35.9694	35.9694	37.5681	39.1667	40.7654	42.3640	43.9627	(42c)

Average daily hot water use (litres/day)		135.4907 (43)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Daily hot water use

	147.3967	144.2491	140.4161	134.5878	129.8547	124.7663	122.8109	126.6274	130.6524	135.9943	141.9125	147.0144	(44)
Energy conte	233.4403	205.4088	215.8143	184.2439	174.8094	153.4147	148.5292	156.7911	161.1075	184.5430	202.1803	230.1891	(45)
Energy content (annual)										Total = Sum(45)m =		2250.4717	

Distribution loss (46)m = 0.15 x (45)m

	35.0160	30.8113	32.3722	27.6366	26.2214	23.0122	22.2794	23.5187	24.1661	27.6815	30.3271	34.5284	(46)

Water storage loss:

Store volume												210.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5800	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8532	(55)

Total storage loss

	26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(56)

If cylinder contains dedicated solar storage

	26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

	283.1519	250.3096	265.5259	232.3519	224.5210	201.5227	198.2408	206.5027	209.2155	234.2546	250.2883	279.9007	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

	283.1519	250.3096	265.5259	232.3519	224.5210	201.5227	198.2408	206.5027	209.2155	234.2546	250.2883	279.9007	(64)
										Total per year (kWh/year) = Sum(64)m =		2835.7857	(64)

Electric shower(s)

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)

Heat gains from water heating, kWh/month

	117.3882	104.2191	111.5276	99.7475	97.8934	89.4968	89.1552	91.9023	92.0546	101.1298	105.7114	116.3071	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	42.4554	37.7085	30.6667	23.2166	17.3547	14.6516	15.8315	20.5784	27.6203	35.0704	40.9323	43.6354	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	426.1571	430.5793	419.4356	395.7119	365.7649	337.6190	318.8159	314.3937	325.5374	349.2611	379.2081	407.3540	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	(71)

Water heating gains (Table 5)

	157.7798	155.0879	149.9026	138.5382	131.5771	124.3011	119.8323	123.5246	127.8537	135.9272	146.8213	156.3268	(72)

Total internal gains

	738.7268	735.7102	712.3392	669.8011	627.0312	588.9061	566.8141	570.8312	593.3458	632.5931	679.2961	719.6506	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	5.8000	16.6187	0.3000	0.0000	0.7700	22.2657	(76)
South	1.5400	39.5594	0.3000	0.0000	0.7700	14.0729	(78)
West	2.8100	16.6187	0.3000	0.0000	0.7700	10.7874	(80)

Solar gains	47.1259	92.1362	150.5074	212.3565	247.7989	256.1042	239.9172	206.9353	173.0799	110.9570	60.1273	42.0664	(83)
Total gains	785.8527	827.8464	862.8467	882.1576	874.8301	845.0103	806.7313	777.7664	766.4257	743.5500	739.4234	761.7170	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	28.7231	28.9039	28.9039	29.6501	29.4600	30.4359	30.8446	30.8446	30.4359	29.6501	29.6501	29.4600	
alpha	2.9149	2.9269	2.9269	2.9767	2.9640	3.0291	3.0563	3.0563	3.0291	2.9767	2.9767	2.9640	
util living area	0.9170	0.8993	0.8685	0.7989	0.6934	0.5422	0.4322	0.4547	0.6424	0.8100	0.8886	0.9218	(86)
Living	19.2595	19.4592	19.7642	20.2596	20.6347	20.8808	20.9546	20.9466	20.7803	20.3257	19.7751	19.2659	
Non living	18.6923	18.8906	19.1881	19.6776	20.0239	20.2551	20.3195	20.3143	20.1735	19.7460	19.2148	18.7106	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.1096	19.4592	19.7642	20.2596	20.6347	20.8808	20.9546	20.9466	20.7803	20.3257	19.7751	19.5085	(87)
Th 2	20.3004	20.3045	20.3045	20.3209	20.3168	20.3373	20.3455	20.3455	20.3373	20.3209	20.3209	20.3168	(88)
util rest of house	0.9089	0.8896	0.8555	0.7784	0.6601	0.4941	0.3744	0.3963	0.5997	0.7870	0.8765	0.9142	(89)
MIT 2	19.4778	18.8906	19.1881	19.6776	20.0239	20.2551	20.3195	20.3143	20.1735	19.7460	19.2148	18.9353	(90)
Living area fraction										fLA = Living area / (4) =		0.2917	(91)
MIT	19.6621	19.0565	19.3562	19.8474	20.2021	20.4377	20.5048	20.4987	20.3506	19.9151	19.3783	19.1025	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6621	19.0565	19.3562	19.8474	20.2021	20.4377	20.5048	20.4987	20.3506	19.9151	19.3783	19.1025	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9007	0.8691	0.8352	0.7626	0.6541	0.5016	0.3888	0.4103	0.6006	0.7717	0.8569	0.8984	(94)
Useful gains	707.8127	719.5149	720.6392	672.7695	572.2365	423.8665	313.6395	319.1333	460.3255	573.7723	633.6380	684.3345	(95)
Ext temp.	4.7000	5.3000	6.7000	9.3000	12.3000	15.0000	16.6000	16.5000	14.1000	10.8000	7.5000	4.6000	(96)
Heat loss rate W	1342.0661	1226.2088	1128.1326	916.4963	691.0707	460.2974	326.1589	334.0071	529.1101	792.0456	1032.1433	1268.3045	(97)

Space heating kWh
471.8845 340.4983 303.1751 175.4833 88.4127 0.0000 0.0000 0.0000 0.0000 162.3953 286.9238 434.4737 (98a)
Space heating requirement - total per year (kWh/year) 2263.2468
Solar heating kWh
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (98b)
Solar heating contribution - total per year (kWh/year) 0.0000
Space heating kWh
471.8845 340.4983 303.1751 175.4833 88.4127 0.0000 0.0000 0.0000 0.0000 162.3953 286.9238 434.4737 (98c)
Space heating requirement after solar contribution - total per year (kWh/year) 2263.2468
Space heating per m2 (98c) / (4) = 18.8227 (99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (201)
Fraction of space heat from main system(s) 1.0000 (202)
Efficiency of main space heating system 1 (in %) 280.2801 (206)
Efficiency of main space heating system 2 (in %) 0.0000 (207)
Efficiency of secondary/supplementary heating system, % 0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	471.8845	340.4983	303.1751	175.4833	88.4127	0.0000	0.0000	0.0000	0.0000	162.3953	286.9238	434.4737	(98)
Space heating efficiency (main heating system 1)	280.2801	280.2801	280.2801	280.2801	280.2801	0.0000	0.0000	0.0000	0.0000	280.2801	280.2801	280.2801	(210)
Space heating fuel (main heating system)	168.3618	121.4850	108.1686	62.6100	31.5444	0.0000	0.0000	0.0000	0.0000	57.9404	102.3704	155.0141	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	283.1519	250.3096	265.5259	232.3519	224.5210	201.5227	198.2408	206.5027	209.2155	234.2546	250.2883	279.9007	(64)
Efficiency of water heater												279.7217	(216)
(217)m	279.7217	279.7217	279.7217	279.7217	279.7217	279.7217	279.7217	279.7217	279.7217	279.7217	279.7217	279.7217	(217)
Fuel for water heating, kWh/month	101.2263	89.4852	94.9250	83.0654	80.2658	72.0440	70.8707	73.8243	74.7941	83.7456	89.4776	100.0640	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	45.0156	40.6593	45.0156	43.5635	45.0156	43.5635	45.0156	45.0156	43.5635	45.0156	43.5635	45.0156	(231)
Lighting	37.1610	29.8119	26.8423	19.6658	15.1905	12.4107	13.8573	18.0122	23.3960	30.6969	34.6720	38.1938	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year
Space heating fuel - main system 1 807.4948 (211)
Space heating fuel - main system 2 0.0000 (213)
Space heating fuel - secondary 0.0000 (215)
Efficiency of water heater 279.7217
Water heating fuel used 1013.7881 (219)
Space cooling fuel 0.0000 (221)

Electricity for pumps and fans:
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.3580)
mechanical ventilation fans (SFP = 1.3580) 530.0227 (230a)
Total electricity for the above, kWh/year 530.0227 (231)
Electricity for lighting (calculated in Appendix L) 299.9105 (232)

Energy saving/generation technologies (Appendices M ,N and Q)
PV generation 0.0000 (233)
Wind generation 0.0000 (234)
Hydro-electric generation (Appendix N) 0.0000 (235a)
Electricity generated - Micro CHP (Appendix N) 0.0000 (235)
Appendix Q - special features
Energy saved or generated -0.0000 (236)
Energy used 0.0000 (237)
Total delivered energy for all uses 2651.2161 (238)

10a. Fuel costs - using BEDF prices (583)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	807.4948	28.4300	229.5708	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1013.7881	28.4300	288.2200	(247)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(247a)
Pumps, fans and electric keep-hot	530.0227	28.4300	150.6855	(249)
Energy for lighting	299.9105	28.4300	85.2646	(250)
Additional standing charges			0.0000	(251)
Total energy cost			753.7408	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	807.4948	0.1550	125.1526	(261)

Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1013.7881	0.1410	142.9306 (264)
Space and water heating			268.0832 (265)
Pumps, fans and electric keep-hot	530.0227	0.1387	73.5207 (267)
Energy for lighting	299.9105	0.1443	43.2864 (268)
Total CO2, kg/year			384.8902 (272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	807.4948	1.5738	1270.8276	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1013.7881	1.5213	1542.2980	(278)
Space and water heating			2813.1256	(279)
Pumps, fans and electric keep-hot	530.0227	1.5128	801.8183	(281)
Energy for lighting	299.9105	1.5338	460.0128	(282)
Total Primary energy kWh/year			4074.9567	(286)

SAP 10 EPC IMPROVEMENTS

001

Current energy efficiency rating: B 84
Current environmental impact rating: A 97

N Solar water heating		Recommended
U Solar photovoltaic panels		Recommended
V2 Wind turbine		Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
N Solar water heating	+ 1.2	-£ 54	-23 kg (6.0%)
U Solar photovoltaic panels	+ 6.9	-£ 289	-207 kg (57.2%)

	Typical annual savings		Energy efficiency	Environmental impact
Recommended measures				
Solar water heating	£54	0.19 kg/m²	B 85	A 97
Solar photovoltaic panels	£289	1.72 kg/m²	A 92	A 99
Total Savings	£342	1.91 kg/m²		

Potential energy efficiency rating: A 92
Potential environmental impact rating: A 99

Fuel prices for cost data on this page from database revision number 583 TEST (01 Oct 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, West Pennines (England)):

	Current	Potential	Saving
Electricity	£754	£700	£54
Space heating	£380	£406	-£26
Water heating	£288	£209	£79
Lighting	£85	£85	£0
Generated (PV)	-£0	-£289	£289
Total cost of fuels	£754	£411	£343
Total cost of uses	£753	£411	£342
Delivered energy	22 kWh/m²	7 kWh/m²	15 kWh/m²
Carbon dioxide emissions	0.4 tonnes	0.2 tonnes	0.2 tonnes
CO2 emissions per m²	3 kg/m²	1 kg/m²	2 kg/m²
Primary energy	34 kWh/m²	18 kWh/m²	16 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

1. Overall dwelling characteristics

Main dwelling	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	47.0600 (1b)	x	2.4800 (2b)	=	116.7088	(1b) - (3b)
First floor	49.7800 (1c)	x	2.7800 (2c)	=	138.3884	(1c) - (3c)
Second floor	23.4000 (1d)	x	2.7700 (2d)	=	64.8180	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	120.2400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	319.9152	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)

Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.2500 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2125 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2709	0.2656	0.2603	0.2338	0.2284	0.2019	0.2019	0.1966	0.2125	0.2284	0.2391	0.2497	(22b)

Balanced mechanical ventilation with heat recovery	
If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	80.1000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.3704	0.3651	0.3598	0.3332	0.3279	0.3014	0.3014	0.2961	0.3120	0.3279	0.3386	0.3492	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Door			4.1400	1.0000	4.1400			(26)
Window			10.1500	0.7752	7.8682			(27)
GF			47.0600	0.0900	4.2354	75.0000	3529.5000	(28a)
Exposed Floor			2.7200	0.1400	0.3808	20.0000	54.4000	(28b)
Main	129.1100	14.2900	114.8200	0.1300	14.9266	9.0000	1033.3800	(29a)
Dwarf Wall (PIRx0.72)	16.7700		16.7700	0.0900	1.5093	9.0000	150.9300	(29a)
PIJ	15.5100		15.5100	0.1300	2.0163	9.0000	139.5900	(30)
PIR	17.5400		17.5400	0.1300	2.2802	9.0000	157.8600	(30)
Residual Ceiling	26.3800		26.3800	0.0900	2.3742	9.0000	237.4200	(30)
Total net area of external elements Aum(A, m2)			255.0900					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		39.7310			(33)
Main dwelling								
Party Wall 1			47.6000	0.0000	0.0000	20.0000	952.0000	(32)
Timber			124.1700			9.0000	1117.5300	(32c)
FF			47.0600			18.0000	847.0800	(32d)
SF			23.4000			18.0000	421.2000	(32d)
GF			47.0600			9.0000	423.5400	(32e)
FF			23.4000			9.0000	210.6000	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 9275.0300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	77.1376 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	10.0000	0.1150	1.1500
E3 Sill	10.0000	0.0170	0.1700
E4 Jamb	33.0000	0.0940	3.1020
E5 Ground floor (normal)	20.0500	0.0670	1.3434
E11 Eaves (insulation at rafter level)	18.1000	0.0250	0.4525
E16 Corner (normal)	24.0800	0.0680	1.6374
E12 Gable (insulation at ceiling level)	5.6600	0.0770	0.4358
E6 Intermediate floor within a dwelling	39.5500	0.0320	1.2656
E17 Corner (inverted - internal area greater than external area)	2.4800	-0.0290	-0.0719
P1 Party wall - Ground floor	9.0500	0.3200	2.8960
E20 Exposed floor (normal)	3.3800	0.0790	0.2670
E21 Exposed floor (inverted)	3.3800	0.0630	0.2129
E13 Gable (insulation at rafter level)	8.2800	0.0740	0.6127
E18 Party wall between dwellings	10.5200	0.0920	0.9678
R6 Flat ceiling	18.1000	-0.0430	-0.7783

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	13.6630 (36)
Point Thermal bridges	(36a) = 0.0000
Total fabric heat loss	(33) + (36) + (36a) = 53.3940 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	39.1078	38.5470	37.9861	35.1819	34.6210	31.8168	31.8168	31.2559	32.9385	34.6210	35.7427	36.8644	(38)
Heat transfer coeff	92.5019	91.9410	91.3802	88.5759	88.0150	85.2108	85.2108	84.6499	86.3325	88.0150	89.1368	90.2585	(39)
Average = Sum(39)m / 12 =												88.4357	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7693	0.7646	0.7600	0.7367	0.7320	0.7087	0.7087	0.7040	0.7180	0.7320	0.7413	0.7507	(40)
HLP (average)												0.7355	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.8642 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
72.2437	71.1580	69.5759	66.5490	64.3151	61.8240	60.4080	61.9781	63.6992	66.3739	69.4659	71.9669	(42a)

Hot water usage for baths

31.1904	30.7271	30.0748	28.8721	27.9715	26.9729	26.4334	27.0812	27.7865	28.8550	30.0826	31.0849	(42b)

Hot water usage for other uses

43.9627	42.3640	40.7654	39.1667	37.5681	35.9694	35.9694	37.5681	39.1667	40.7654	42.3640	43.9627	(42c)

Average daily hot water use (litres/day)	135.4907 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	147.3967	144.2491	140.4161	134.5878	129.8547	124.7663	122.8109	126.6274	130.6524	135.9943	141.9125	147.0144	(44)
Energy conte	233.4403	205.4088	215.8143	184.2439	174.8094	153.4147	148.5292	156.7911	161.1075	184.5430	202.1803	230.1891	(45)
Energy content (annual)										Total = Sum(45)m =		2250.4717	

Distribution loss (46)m = 0.15 x (45)m

	35.0160	30.8113	32.3722	27.6366	26.2214	23.0122	22.2794	23.5187	24.1661	27.6815	30.3271	34.5284 (46)

Water storage loss:

Store volume	210.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):	1.5800 (48)
Temperature factor from Table 2b	0.5400 (49)
Enter (49) or (54) in (55)	0.8532 (55)

Total storage loss

	26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492 (56)

If cylinder contains dedicated solar storage

	17.0031	15.3576	17.0031	16.4546	17.0031	16.4546	17.0031	17.0031	16.4546	17.0031	16.4546	17.0031 (57)
Primary loss	23.2624	21.0112	21.8667	15.7584	10.4681	9.9053	10.2355	11.1660	17.1091	21.8667	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)

Total heat required for water heating calculated for each month

	273.7058	241.7776	254.6841	216.4569	202.2805	179.7746	175.7677	184.9602	194.6712	223.4127	241.1469	270.4545 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)

Aperture area of solar collector	3.0000 (H1)
Zero-loss collector efficiency	0.8000 (H2)
Collector linear heat loss coefficient	1.8000 (H3)
Collector 2nd order heat loss coefficient	0.0000 (H4)
Collector loop efficiency	0.9000 (H5)
Incidence angle modifier	1.0000 (H6)
Overshading factor	0.8000 (H8)
Overall heat loss coefficient of system	6.5000 (H10)
Heat loss coefficient of collector loop	3.9667 (H11)
Dedicated solar storage volume	75.0000 (H12)
If combined cylinder, total volume of cylinder	210.0000 (H13)
Effective solar volume	115.5000 (H14)
Reference volume	225.0000 (H15)
Storage tank correction coefficient	1.1814 (H16)
Heat delivered to hot water	661.7243 (H24)
Heat delivered to space heating	0.0000 (H29)
Solar input	661.7243

Solar input	-0.0000	-20.2144	-62.8139	-84.6635	-109.0628	-100.4582	-99.7212	-87.9174	-62.1691	-33.3828	-1.3210	-0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)

Output from w/h

	273.7058	221.5632	191.8702	131.7934	93.2177	79.3164	76.0465	97.0428	132.5020	190.0299	239.8259	270.4545 (64)

Total per year (kWh/year) = Sum(64)m = 1997.3683 (64)

Electric shower(s)

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

	109.8313	97.3935	102.8540	87.0315	80.1010	72.0983	71.1768	74.6683	80.4192	92.4563	98.3982	108.7502 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	42.4554	37.7085	30.6667	23.2166	17.3547	14.6516	15.8315	20.5784	27.6203	35.0704	40.9323	43.6354 (67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	426.1571	430.5793	419.4356	395.7119	365.7649	337.6190	318.8159	314.3937	325.5374	349.2611	379.2081	407.3540 (68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)

Losses e.g. evaporation (negative values) (Table 5)

	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695 (71)

Water heating gains (Table 5)

	147.6227	144.9308	138.2447	120.8771	107.6627	100.1365	95.6677	100.3606	111.6933	124.2693	136.6642	146.1697 (72)

Total internal gains

	728.5696	725.5530	700.6813	652.1399	603.1167	564.7415	542.6495	547.6671	577.1855	620.9351	669.1389	709.4934 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	5.8000	19.6403	0.3000	0.0000	0.7700	26.3140	(76)
South	1.5400	46.7521	0.3000	0.0000	0.7700	16.6316	(78)
West	2.8100	19.6403	0.3000	0.0000	0.7700	12.7487	(80)

Solar gains	55.6943	103.6532	160.5412	222.7516	265.7955	269.5834	257.6383	225.6169	182.6072	120.0518	68.4207	46.4945 (83)
Total gains	784.2639	829.2062	861.2225	874.8915	868.9122	834.3249	800.2878	773.2840	759.7927	740.9869	737.5596	755.9879 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	27.8524	28.0223	28.1943	29.0869	29.2722	30.2356	30.2356	30.4359	29.8427	29.2722	28.9039	28.5447	
alpha	2.8568	2.8682	2.8796	2.9391	2.9515	3.0157	3.0157	3.0291	2.9895	2.9515	2.9269	2.9030	
util living area	0.9234	0.9066	0.8753	0.8162	0.7242	0.5769	0.4419	0.4702	0.6523	0.8197	0.8980	0.9288	(86)
Living	19.0951	19.3052	19.6682	20.1566	20.5527	20.8470	20.9492	20.9381	20.7619	20.2721	19.6433	19.0931	
Non living	18.5161	18.7249	19.0830	19.5703	19.9462	20.2241	20.3041	20.3006	20.1474	19.6891	19.0743	18.5259	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.0255	19.3052	19.6682	20.1566	20.5527	20.8470	20.9492	20.9381	20.7619	20.2721	19.6433	19.3598	(87)
Th 2	20.2800	20.2841	20.2881	20.3086	20.3127	20.3332	20.3332	20.3373	20.3250	20.3127	20.3045	20.2963	(88)
util rest of house	0.9159	0.8976	0.8629	0.7971	0.6939	0.5309	0.3823	0.4112	0.6091	0.7976	0.8869	0.9219	(89)
MIT 2	19.3777	18.7249	19.0830	19.5703	19.9462	20.2241	20.3041	20.3006	20.1474	19.6891	19.0743	18.7736	(90)
Living area fraction									fLA = Living area / (4) =			0.2917	(91)
MIT	19.5667	18.8942	19.2537	19.7414	20.1231	20.4059	20.4923	20.4866	20.3267	19.8592	19.2403	18.9446	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5667	18.8942	19.2537	19.7414	20.1231	20.4059	20.4923	20.4866	20.3267	19.8592	19.2403	18.9446	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9076	0.8766	0.8418	0.7798	0.6850	0.5361	0.3969	0.4248	0.6092	0.7813	0.8667	0.9060	(94)
Useful gains	711.7883	726.8823	725.0201	682.2090	595.1844	447.2625	317.6237	328.5279	462.9014	578.9247	639.2751	684.9384	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1412.1952	1286.6411	1165.4379	960.2829	741.3633	494.7215	331.6667	345.9282	537.5680	814.9494	1082.1513	1330.8250	(97)
Space heating kWh	521.1027	376.1580	327.6709	200.2132	108.7571	0.0000	0.0000	0.0000	0.0000	175.6024	318.8709	480.5396	(98a)
Space heating requirement - total per year (kWh/year)												2508.9148	
Solar heating kWh	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	521.1027	376.1580	327.6709	200.2132	108.7571	0.0000	0.0000	0.0000	0.0000	175.6024	318.8709	480.5396	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2508.9148	
Space heating per m2											(98c) / (4) =	20.8659	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												281.1500	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	521.1027	376.1580	327.6709	200.2132	108.7571	0.0000	0.0000	0.0000	0.0000	175.6024	318.8709	480.5396	(98)
Space heating efficiency (main heating system 1)	281.1500	281.1500	281.1500	281.1500	281.1500	0.0000	0.0000	0.0000	0.0000	281.1500	281.1500	281.1500	(210)
Space heating fuel (main heating system)	185.3468	133.7926	116.5466	71.2122	38.6829	0.0000	0.0000	0.0000	0.0000	62.4586	113.4166	170.9193	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	273.7058	221.5632	191.8702	131.7934	93.2177	79.3164	76.0465	97.0428	132.5020	190.0299	239.8259	270.4545	(64)
Efficiency of water heater												279.7133	(216)
(217)m	279.7133	279.7133	279.7133	279.7133	279.7133	279.7133	279.7133	279.7133	279.7133	279.7133	279.7133	279.7133	(217)
Fuel for water heating, kWh/month	97.8523	79.2108	68.5953	47.1173	33.3262	28.3563	27.1873	34.6937	47.3707	67.9374	85.7399	96.6899	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	51.8101	46.7963	51.8101	50.1389	51.8101	50.1389	51.8101	51.8101	50.1389	51.8101	50.1389	51.8101	(231)
Lighting	37.1610	29.8119	26.8423	19.6658	15.1905	12.4107	13.8573	18.0122	23.3960	30.6969	34.6720	38.1938	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-38.4110	-57.3556	-86.7846	-101.2323	-110.6909	-101.0725	-99.8961	-93.0965	-80.9700	-66.7085	-43.0519	-32.7253	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-11.6755	-26.2244	-55.5617	-89.5398	-124.9919	-130.6412	-128.7554	-106.6774	-75.4931	-40.1374	-16.3579	-9.1885	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												892.3758	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												279.7133	
Water heating fuel used												714.0771	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.3580)													
mechanical ventilation fans (SFP = 1.3580)												530.0227	(230a)
pump for solar water heating												80.0000	(230g)
Total electricity for the above, kWh/year												610.0227	(231)
Electricity for lighting (calculated in Appendix L)												299.9105	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1727.2394	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												789.1467	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	892.3758	16.4900	147.1528	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	714.0771	16.4900	117.7513	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)

Pumps, fans and electric keep-hot	530.0227	16.4900	87.4007	(249)
Pump for solar water heating	80.0000	16.4900	13.1920	(249)
Energy for lighting	299.9105	16.4900	49.4552	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-911.9952	16.4900	-150.3880	
PV Unit electricity exported	-815.2442	5.5900	-45.5721	
Total			-195.9602	(252)
Total energy cost			218.9919	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.4771	(257)
SAP value		92.2661	
SAP rating (Section 12)		92	(258)
SAP band		A	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	892.3758	0.1549	138.2196	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	714.0771	0.1460	104.2877	(264)
Space and water heating			242.5073	(265)
Pumps, fans and electric keep-hot	610.0227	0.1387	84.6177	(267)
Energy for lighting	299.9105	0.1443	43.2864	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-911.9952	0.1340	-122.2331	
PV Unit electricity exported	-815.2442	0.1237	-100.8502	
Total			-223.0832	(269)
Total CO2, kg/year			147.3281	(272)
CO2 emissions per m2			1.2300	(273)
EI value			98.8053	
EI rating			99	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

Main dwelling	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	47.0600	(1b) x	2.4800	(2b) =	116.7088	(1b) - (3b)
First floor	49.7800	(1c) x	2.7800	(2c) =	138.3884	(1c) - (3c)
Second floor	23.4000	(1d) x	2.7700	(2d) =	64.8180	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	120.2400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		319.9152	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.2500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2125	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.6000	4.5000	4.5000	4.1000	4.2000	3.7000	3.5000	3.5000	3.7000	4.1000	4.1000	4.2000	(22)
Wind factor	1.1500	1.1250	1.1250	1.0250	1.0500	0.9250	0.8750	0.8750	0.9250	1.0250	1.0250	1.0500	(22a)
Adj infilt rate	0.2444	0.2391	0.2391	0.2178	0.2231	0.1966	0.1859	0.1859	0.1966	0.2178	0.2178	0.2231	(22b)

Balanced mechanical ventilation with heat recovery		
If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	80.1000	(23c)

Effective ac	0.3439	0.3386	0.3386	0.3173	0.3226	0.2961	0.2854	0.2854	0.2961	0.3173	0.3173	0.3226 (25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Door			4.1400	1.0000	4.1400			(26)
Window			10.1500	0.7752	7.8682			(27)
GF			47.0600	0.0900	4.2354	75.0000	3529.5000	(28a)
Exposed Floor			2.7200	0.1400	0.3808	20.0000	54.4000	(28b)
Main	129.1100	14.2900	114.8200	0.1300	14.9266	9.0000	1033.3800	(29a)
Dwarf Wall (PIRx0.72)	16.7700		16.7700	0.0900	1.5093	9.0000	150.9300	(29a)
PIJ	15.5100		15.5100	0.1300	2.0163	9.0000	139.5900	(30)
PIR	17.5400		17.5400	0.1300	2.2802	9.0000	157.8600	(30)
Residual Ceiling	26.3800		26.3800	0.0900	2.3742	9.0000	237.4200	(30)
Total net area of external elements Aum(A, m2)			255.0900					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		39.7310			(33)
Main dwelling								
Party Wall 1			47.6000	0.0000	0.0000	20.0000	952.0000	(32)
Timber			124.1700			9.0000	1117.5300	(32c)
FF			47.0600			18.0000	847.0800	(32d)
SF			23.4000			18.0000	421.2000	(32d)
GF			47.0600			9.0000	423.5400	(32e)
FF			23.4000			9.0000	210.6000	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	9275.0300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		77.1376 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	10.0000	0.1150	1.1500
E3 Sill	10.0000	0.0170	0.1700
E4 Jamb	33.0000	0.0940	3.1020
E5 Ground floor (normal)	20.0500	0.0670	1.3434
E11 Eaves (insulation at rafter level)	18.1000	0.0250	0.4525
E16 Corner (normal)	24.0800	0.0680	1.6374
E12 Gable (insulation at ceiling level)	5.6600	0.0770	0.4358
E6 Intermediate floor within a dwelling	39.5500	0.0320	1.2656
E17 Corner (inverted - internal area greater than external area)	2.4800	-0.0290	-0.0719
P1 Party wall - Ground floor	9.0500	0.3200	2.8960
E20 Exposed floor (normal)	3.3800	0.0790	0.2670
E21 Exposed floor (inverted)	3.3800	0.0630	0.2129
E13 Gable (insulation at rafter level)	8.2800	0.0740	0.6127
E18 Party wall between dwellings	10.5200	0.0920	0.9678
R6 Flat ceiling	18.1000	-0.0430	-0.7783

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		13.6630 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	53.3940 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	36.3036	35.7427	35.7427	33.4993	34.0602	31.2559	30.1342	30.1342	31.2559	33.4993	33.4993	34.0602	(38)
Heat transfer coeff	89.6976	89.1368	89.1368	86.8933	87.4542	84.6499	83.5282	83.5282	84.6499	86.8933	86.8933	87.4542	(39)
Average = Sum(39)m / 12 =												86.6597	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7460	0.7413	0.7413	0.7227	0.7273	0.7040	0.6947	0.6947	0.7040	0.7227	0.7227	0.7273	(40)
HLP (average)												0.7207	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.8642	(42)
Hot water usage for mixer showers	72.2437	71.1580	69.5759	66.5490	64.3151	61.8240	60.4080	61.9781	63.6992	66.3739	69.4659	71.9669	(42a)
Hot water usage for baths	31.1904	30.7271	30.0748	28.8721	27.9715	26.9729	26.4334	27.0812	27.7865	28.8550	30.0826	31.0849	(42b)
Hot water usage for other uses	43.9627	42.3640	40.7654	39.1667	37.5681	35.9694	35.9694	37.5681	39.1667	40.7654	42.3640	43.9627	(42c)
Average daily hot water use (litres/day)												135.4907	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	147.3967	144.2491	140.4161	134.5878	129.8547	124.7663	122.8109	126.6274	130.6524	135.9943	141.9125	147.0144	(44)
Energy conte	233.4403	205.4088	215.8143	184.2439	174.8094	153.4147	148.5292	156.7911	161.1075	184.5430	202.1803	230.1891	(45)
Energy content (annual)										Total = Sum(45)m =		2250.4717	
Distribution loss (46)m = 0.15 x (45)m	35.0160	30.8113	32.3722	27.6366	26.2214	23.0122	22.2794	23.5187	24.1661	27.6815	30.3271	34.5284	(46)
Water storage loss:													
Store volume												210.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5800	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8532	(55)
Total storage loss	26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(56)
If cylinder contains dedicated solar storage	17.0031	15.3576	17.0031	16.4546	17.0031	16.4546	17.0031	17.0031	16.4546	17.0031	16.4546	17.0031	(57)
Primary loss	23.2624	21.0112	21.8667	15.7584	10.4681	9.9053	10.2355	11.1660	17.1091	21.8667	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	273.7058	241.7776	254.6841	216.4569	202.2805	179.7746	175.7677	184.9602	194.6712	223.4127	241.1469	270.4545	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Aperture area of solar collector												3.0000	(H1)
Zero-loss collector efficiency												0.8000	(H2)
Collector linear heat loss coefficient												1.8000	(H3)
Collector 2nd order heat loss coefficient												0.0000	(H4)
Collector loop efficiency												0.9000	(H5)
Incidence angle modifier												1.0000	(H6)
Overshading factor												0.8000	(H8)
Overall heat loss coefficient of system												6.5000	(H10)
Heat loss coefficient of collector loop												3.9667	(H11)
Dedicated solar storage volume												75.0000	(H12)
If combined cylinder, total volume of cylinder												210.0000	(H13)

Effective solar volume												115.5000	(H14)
Reference volume												225.0000	(H15)
Storage tank correction coefficient												1.1814	(H16)
Heat delivered to hot water												605.2985	(H24)
Heat delivered to space heating												0.0000	(H29)
Solar input												605.2985	
Solar input	-0.0000	-14.4753	-57.1346	-80.0537	-101.5431	-95.3649	-92.1367	-79.1730	-57.3788	-28.0385	-0.0000	-0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	273.7058	227.3023	197.5495	136.4032	100.7374	84.4097	83.6309	105.7872	137.2924	195.3743	241.1469	270.4545	(64)
									Total per year (kWh/year) = Sum(64)m =			2053.7941	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month													
	109.8313	97.3935	102.8540	87.0315	80.1010	72.0983	71.1768	74.6683	80.4192	92.4563	98.3982	108.7502	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	42.4554	37.7085	30.6667	23.2166	17.3547	14.6516	15.8315	20.5784	27.6203	35.0704	40.9323	43.6354	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	426.1571	430.5793	419.4356	395.7119	365.7649	337.6190	318.8159	314.3937	325.5374	349.2611	379.2081	407.3540	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	(71)
Water heating gains (Table 5)													
	147.6227	144.9308	138.2447	120.8771	107.6627	100.1365	95.6677	100.3606	111.6933	124.2693	136.6642	146.1697	(72)
Total internal gains													
	728.5696	725.5530	700.6813	652.1399	603.1167	564.7415	542.6495	547.6671	577.1855	620.9351	669.1389	709.4934	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	5.8000	16.6187	0.3000	0.0000	0.7700	22.2657	(76)
South	1.5400	39.5594	0.3000	0.0000	0.7700	14.0729	(78)
West	2.8100	16.6187	0.3000	0.0000	0.7700	10.7874	(80)

Solar gains	47.1259	92.1362	150.5074	212.3565	247.7989	256.1042	239.9172	206.9353	173.0799	110.9570	60.1273	42.0664	(83)
Total gains	775.6956	817.6892	851.1887	864.4964	850.9156	820.8457	782.5666	754.6023	750.2653	731.8921	729.2662	751.5599	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	28.7231	28.9039	28.9039	29.6501	29.4600	30.4359	30.8446	30.8446	30.4359	29.6501	29.6501	29.4600	
alpha	2.9149	2.9269	2.9269	2.9767	2.9640	3.0291	3.0563	3.0563	3.0291	2.9767	2.9767	2.9640	
util living area													
	0.9193	0.9019	0.8719	0.8056	0.7045	0.5543	0.4437	0.4665	0.6514	0.8151	0.8917	0.9240	(86)
Living	19.2418	19.4425	19.7471	20.2399	20.6178	20.8733	20.9512	20.9427	20.7715	20.3121	19.7590	19.2478	
Non living	18.6751	18.8746	19.1719	19.6594	20.0095	20.2496	20.3174	20.3118	20.1666	19.7336	19.1994	18.6929	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.1006	19.4425	19.7471	20.2399	20.6178	20.8733	20.9512	20.9427	20.7715	20.3121	19.7590	19.4929	(87)
Th 2	20.3004	20.3045	20.3045	20.3209	20.3168	20.3373	20.3455	20.3455	20.3373	20.3209	20.3209	20.3168	(88)
util rest of house													
	0.9114	0.8923	0.8591	0.7854	0.6715	0.5058	0.3849	0.4071	0.6087	0.7924	0.8799	0.9167	(89)
MIT 2	19.4690	18.8746	19.1719	19.6594	20.0095	20.2496	20.3174	20.3118	20.1666	19.7336	19.1994	18.9201	(90)
Living area fraction										fLA = Living area / (4) =		0.2917	(91)
MIT	19.6532	19.0403	19.3398	19.8288	20.1869	20.4316	20.5023	20.4959	20.3431	19.9024	19.3627	19.0872	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6532	19.0403	19.3398	19.8288	20.1869	20.4316	20.5023	20.4959	20.3431	19.9024	19.3627	19.0872	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9032	0.8719	0.8388	0.7693	0.6648	0.5130	0.3993	0.4212	0.6091	0.7768	0.8603	0.9010	(94)
Useful gains	700.6068	712.9594	713.9522	665.0761	565.6570	421.0900	312.4862	317.8013	457.0169	568.5254	627.3799	677.1410	(95)
Ext temp.	4.7000	5.3000	6.7000	9.3000	12.3000	15.0000	16.6000	16.5000	14.1000	10.8000	7.5000	4.6000	(96)
Heat loss rate W													
	1341.2696	1224.7631	1126.6668	914.8794	689.7456	459.7847	325.9539	333.7692	528.4749	790.9394	1030.7902	1266.9660	(97)
Space heating kWh													
	476.6531	343.9320	307.0597	179.8584	92.3219	0.0000	0.0000	0.0000	0.0000	165.4760	290.4554	438.8298	(98a)
Space heating requirement - total per year (kWh/year)												2294.5863	
Solar heating kWh													
	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	476.6531	343.9320	307.0597	179.8584	92.3219	0.0000	0.0000	0.0000	0.0000	165.4760	290.4554	438.8298	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2294.5863	
Space heating per m2											(98c) / (4) =	19.0834	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												280.2801	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	476.6531	343.9320	307.0597	179.8584	92.3219	0.0000	0.0000	0.0000	0.0000	165.4760	290.4554	438.8298	(98)
Space heating efficiency (main heating system 1)													
	280.2801	280.2801	280.2801	280.2801	280.2801	0.0000	0.0000	0.0000	0.0000	280.2801	280.2801	280.2801	(210)
Space heating fuel (main heating system)													
	170.0632	122.7101	109.5546	64.1709	32.9392	0.0000	0.0000	0.0000	0.0000	59.0395	103.6304	156.5683	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	273.7058	227.3023	197.5495	136.4032	100.7374	84.4097	83.6309	105.7872	137.2924	195.3743	241.1469	270.4545	(64)
Efficiency of water heater												279.7217	(216)
(217)m	279.7217	279.7217	279.7217	279.7217	279.7217	279.7217	279.7217	279.7217	279.7217	279.7217	279.7217	279.7217	(217)
Fuel for water heating, kWh/month													
	97.8493	81.2602	70.6236	48.7639	36.0134	30.1763	29.8979	37.8187	49.0818	69.8459	86.2096	96.6870	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	51.8101	46.7963	51.8101	50.1389	51.8101	50.1389	51.8101	51.8101	50.1389	51.8101	50.1389	51.8101	(231)
Lighting	37.1610	29.8119	26.8423	19.6658	15.1905	12.4107	13.8573	18.0122	23.3960	30.6969	34.6720	38.1938	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-33.1245	-51.9718	-82.5074	-97.6523	-105.6956	-98.3110	-96.1235	-88.5388	-78.2402	-62.7667	-38.5226	-29.8990	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-9.2564	-22.3215	-50.9423	-84.2171	-114.0295	-121.8170	-116.8007	-94.6934	-70.0596	-35.9848	-13.6860	-8.0231	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												818.6763	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												279.7217	
Water heating fuel used												734.2276	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.3580)													
mechanical ventilation fans (SFP = 1.3580)												530.0227	(230a)
pump for solar water heating												80.0000	(230g)
Total electricity for the above, kWh/year												610.0227	(231)
Electricity for lighting (calculated in Appendix L)												299.9105	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1605.1846	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												857.6525	(238)

10a. Fuel costs - using BEDF prices (583)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	818.6763	28.4300	232.7497	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	734.2276	28.4300	208.7409	(247)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(247a)
Pumps, fans and electric keep-hot	530.0227	28.4300	150.6855	(249)
Pump for solar water heating	80.0000	28.4300	22.7440	(249)
Energy for lighting	299.9105	28.4300	85.2646	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-863.3534	28.4300	-245.4514	
PV Unit electricity exported	-741.8312	5.8100	-43.1004	
Total			-288.5518	(252)
Total energy cost			411.6328	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	818.6763	0.1549	126.8384	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	734.2276	0.1456	106.9237	(264)
Space and water heating			233.7620	(265)
Pumps, fans and electric keep-hot	610.0227	0.1387	84.6177	(267)
Energy for lighting	299.9105	0.1443	43.2864	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-863.3534	0.1337	-115.4099	

PV Unit electricity exported	-741.8312	0.1235	-91.5959	
Total			-207.0058	(269)
Total CO2, kg/year			154.6602	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	818.6763	1.5736	1288.2493	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	734.2276	1.5387	1129.7467	(278)
Space and water heating			2417.9961	(279)
Pumps, fans and electric keep-hot	610.0227	1.5128	922.8423	(281)
Energy for lighting	299.9105	1.5338	460.0128	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-863.3534	1.4940	-1289.8584	
PV Unit electricity exported	-741.8312	0.4531	-336.1606	
Total			-1626.0191	(283)
Total Primary energy kWh/year			2174.8321	(286)

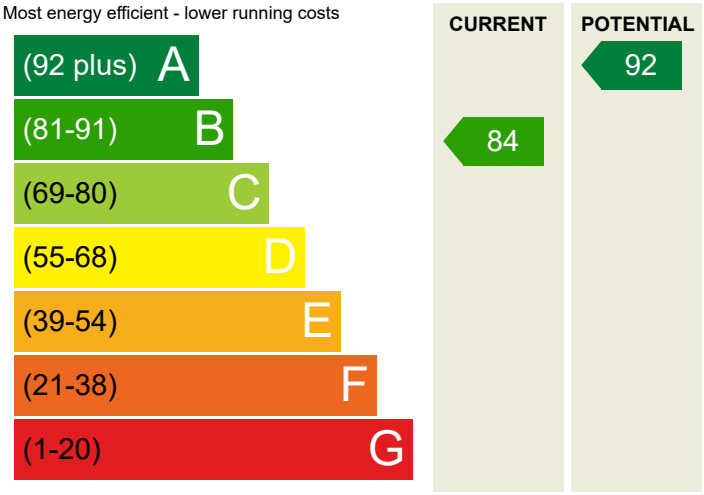
Energy Report

Dwelling Address	840 Rochdale Road, MANCHESTER, M9 8FA
Reference	78449-08-001
Assessment Date	02/07/2025
Submission Date	
Property Type	House, End-Terrace
Total Floor Area	120

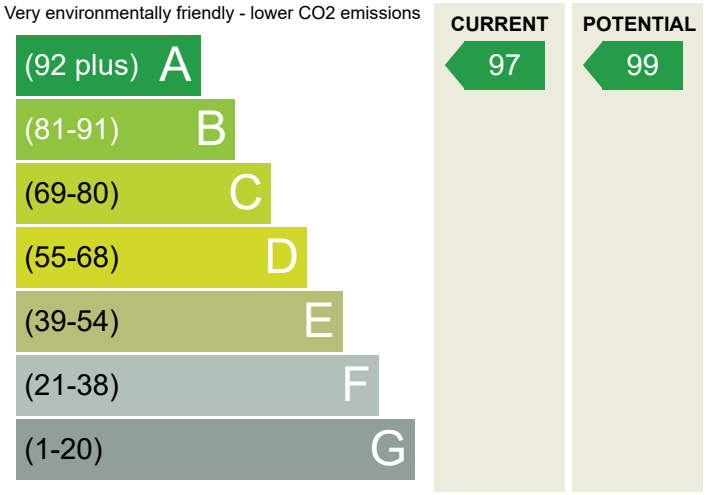
This Energy Report has been generated using the UK's National Calculation Methodology for dwellings, Standard Assessment Procedure (SAP). This methodology is used to assess the energy efficiency of dwellings which is calculated based on a dwelling's heating, hot water, ventilation and lighting usage.

This document is not an Energy Performance Certificate (EPC) as required by the Energy Performance of Buildings Regulations

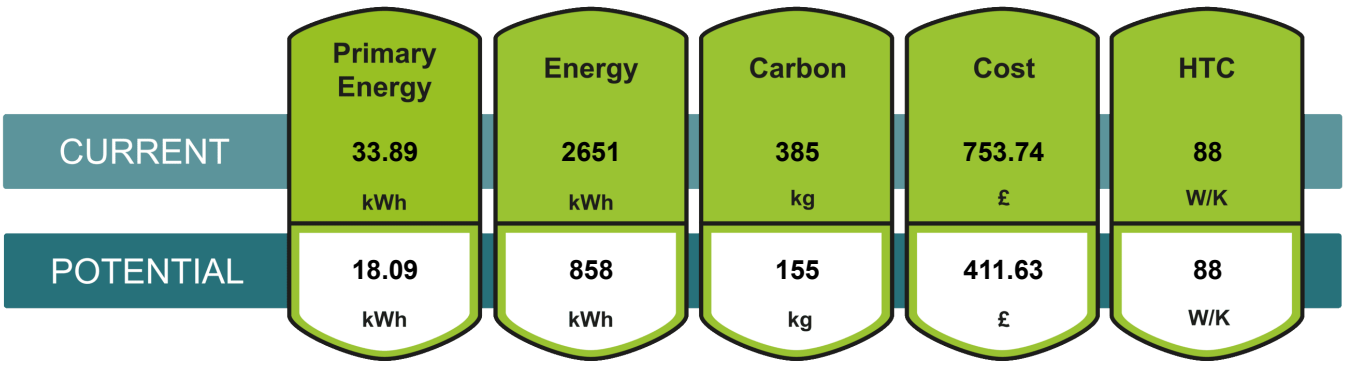
Energy Efficiency Rating



Carbon Dioxide (CO2) Emissions Rating



Additional ratings for your home



Energy Report

Breakdown of property's energy performance

Each feature is assessed as one of the following:

Very Poor | Poor | Average | Good | Very Good

Feature	Description	Energy Performance
Walls	Average thermal transmittance 0.12 W/m²K	Very Good
Roof	Average thermal transmittance 0.11 W/m²K	Very Good
Floor	Average thermal transmittance 0.09 W/m²K	Very Good
Windows	High performance glazing	Very Good
Main heating	Air source heat pump, radiators, electric	Good
Main heating controls	Programmer, room thermostat and TRVs	Good
Secondary heating	None	
Hot water	From main system	Good
Lighting	Good lighting efficiency	Good
Air tightness	Air permeability [AP50] = 5.0 m³/h.m² (as tested)	Good

Recommendations

The recommended measures provided below will help to improve the energy efficiency of the dwelling.
To reach the dwelling's potential energy rating all of the recommended measures shown below would need to be installed.
Having these measures installed individually or in any other order may give a different result when compared with the cumulative potential rating.

Recommended measures	Cumulative savings (per year)	Cumulative rating	Typical costs	Incremental savings (per year)	Cumulative CO2 rating
Solar water heating	£54	B 85	£4,000 - £7,000	£54	A 97
Photovoltaic	£342	A 92	£8,000 - £10,000	£289	A 99

Energy Report

The typical cost is based on average installation prices across the country so may not be representative of the actual costs in your area.

Estimated energy costs of the dwelling

The table below shows the estimated running costs of the space and water heating and lighting within the dwelling. It does not include the energy used from household appliances. The estimated annual costs after potential improvements indicates the total energy cost if all recommended measures named above were installed.

	Estimated annual costs	Estimated annual costs after potential improvements	Potential future savings
Lighting	£85	£85	
Heating	£380	£406	
Hot Water	£288	£209	
New Technologies e.g. Impact of PV	£0	-(£289)	
TOTAL	£754	£412	

Estimated energy use and potential savings

Space Heating
807
kWh per year

Water Heating
1014
kWh per year

Energy Report

About this document

Created by:	
Company/Trading name:	
Phone number:	
Email address:	

Disclaimer

This Energy Report should not under any circumstances be treated as a Condition Survey and cannot be used to indicate that any element of the dwelling (e.g.heating system) is working correctly.
This Energy Report must not be used in situations where an Energy Performance Certificate (EPC) is required.
This Energy Report is generated from a set of data inputs which may not reflect the actual dimensions, services or construction of the dwelling.
The calculation used to generate this report reflects the SAP Methodology current at the time of report generation.

Glossary terms for additional metrics

Primary Energy	The measure of the energy required for lighting, heating and hot water in a property. This includes the efficiency of the property's heating system, power station efficiency for electricity and the energy used to produce the fuel and deliver it to the property.
Energy Used	The estimated amount of fuel energy for lighting, heating and hot water for the property. The estimate is based on typical usage which is likely to be different to actual consumption.
Carbon (CO2)	The current emissions based on the energy estimates.
Cost	The estimated cost of energy. The cost of each unit of fuel is based on an industry standard which is likely to be different to those the occupier actually pays.
Heat Transfer Coefficient	Heat flow through the property envelope where internal and external temperatures are different.

Building Regulations England Part L (BREL) Compliance Report

Approved Document L1 2021 Edition, England assessed by Array SAP 10 program, Array

Date: Fri 03 Oct 2025 15:03:27

Project Information			
Assessed By	Paul Goddard	Building Type	House, End-terrace
OCDEA Registration	EES/005113	Assessment Date	2025-10-03

Dwelling Details			
Assessment Type	As built	Total Floor Area	120 m^2
Site Reference	78449-09	Plot Reference	001
Address	838 Rochdale Road, MANCHESTER, M9 8FA		

Client Details	
Name	-
Company	John Southworth
Address	Unit 10, Charles Street, DUKINFIELD, SK16 4SD

This report covers items included within the SAP calculations. It is not a complete report of regulations compliance.

1a Target emission rate and dwelling emission rate		
Fuel for main heating system	Electricity	
Target carbon dioxide emission rate	*11.0 $kgCO_2/m^2$*	
Dwelling carbon dioxide emission rate	3.38 $kgCO_2/m^2$	OK
1b Target primary energy rate and dwelling primary energy		
Target primary energy	*57.67 kWh_{PE}/m^2*	
Dwelling primary energy	35.71 kWh_{PE}/m^2	OK
1c Target fabric energy efficiency and dwelling fabric energy efficiency		
Target fabric energy efficiency	*39.8 kWh/m^2*	
Dwelling fabric energy efficiency	34.5 kWh/m^2	OK

2a Fabric U-values				
Element	***Maximum permitted average U-Value [W/m^2K]***	**Dwelling average U-Value [W/m^2K]**	**Element with highest individual U-Value**	
External walls	*0.26*	0.13	Walls (1) (0.13)	OK
Party walls	*0.2*	0	Party Wall (1) (0)	**N/A**
Curtain walls	*1.6*	0	N/A	**N/A**
Floors	*0.18*	0.09	Exposed Floor (0.14)	OK
Roofs	*0.16*	0.11	Roof (1) (0.13)	OK
Windows, doors, and roof windows	*1.6*	0.85	Front (1)	OK
Rooflights	*2.2*	N/A	N/A	**N/A**

2b Envelope elements (better than typically expected values are flagged with a subsequent (!))		
Name	**Net area [m^2]**	**U-Value [W/m^2K]**
Exposed wall: Walls (1)	119.53	0.13 **(!)**
Exposed wall: Walls (2)	16.77	0.09 **(!)**
Party wall: Party Wall (1)	40.63	0 **(!)**
Ground floor: GF, GF	47.06	0.09 **(!)**
Upper floor: Exposed Floor, Exposed Floor	2.72	0.14
Exposed roof: Roof (1)	15.51	0.13
Exposed roof: Roof (2)	12.23	0.13
Exposed roof: Roof (3)	26.38	0.09 **(!)**

2c Openings (better than typically expected values are flagged with a subsequent (!))				
Name	**Area [m^2]**	**Orientation**	**Frame factor**	**U-Value [W/m^2K]**
Front, Door	1.99	East	N/A	1 **(!)**
Front, Window	5.8	East	1.0	0.8 **(!)**
Rear, Window	2.81	West	1.0	0.8 **(!)**
Rear, Door	2.15	West	N/A	1 **(!)**
Side, Window	3.8	North	1.0	0.8 **(!)**

2d Thermal bridging (better than typically expected values are flagged with a subsequent (!))
Building part **1**: Thermal bridging calculated from linear thermal transmittances for each junction

Main element	Junction detail	Source	Psi value [W/mK]	Drawing / reference
External wall	E2: Other lintels (including other steel lintels)	Calculated by person with suitable expertise	0.115	Thermal Bridge Report
External wall	E3: Sill	Calculated by person with suitable expertise	0.017 **(!)**	Thermal Bridge Report
External wall	E4: Jamb	Calculated by person with suitable expertise	0.094	Thermal Bridge Report
External wall	E5: Ground floor (normal)	Calculated by person with suitable expertise	0.067	Thermal Bridge Report
External wall	E11: Eaves (insulation at rafter level)	Calculated by person with suitable expertise	0.025 **(!)**	Thermal Bridge Report
External wall	E16: Corner (normal)	Calculated by person with suitable expertise	0.068	Thermal Bridge Report
External wall	E12: Gable (insulation at ceiling level)	Calculated by person with suitable expertise	0.077	Thermal Bridge Report
External wall	E6: Intermediate floor within a dwelling	Calculated by person with suitable expertise	0.032 **(!)**	Thermal Bridge Report
External wall	E17: Corner (inverted - internal area greater than external area)	Calculated by person with suitable expertise	-0.029 **(!)**	Thermal Bridge Report
Party wall	P1: Ground floor	SAP table default	0.32	K1
External wall	E20: Exposed floor (normal)	Calculated by person with suitable expertise	0.079	Thermal Bridge Report
External wall	E21: Exposed floor (inverted)	Calculated by person with suitable expertise	0.063	Thermal Bridge Report
External wall	E13: Gable (insulation at rafter level)	Calculated by person with suitable expertise	0.074	Thermal Bridge Report
External wall	E18: Party wall between dwellings	Calculated by person with suitable expertise	0.092	Thermal Bridge Report
Roof	R6: Flat ceiling	Calculated by person with suitable expertise	-0.043	Thermal Bridge Report
External wall	E25: Staggered party wall between dwellings	Calculated by person with suitable expertise	0.056	Thermal Bridge Report

3 Air permeability (better than typically expected values are flagged with a subsequent (!))		
Maximum permitted air permeability at 50Pa	*8 m^3/hm^2*	
Dwelling air permeability at 50Pa	5 m^3/hm^2, Measured value	OK
Air permeability test certificate reference		

4 Space heating	
Main heating system 1: Heat pump with radiators or underfloor heating - Electricity	
Efficiency	282.1%
Emitter type	Radiators
Flow temperature	45°C
System type	
Manufacturer	Daikin Europe NV
Model	EDLA09DA3V3
Commissioning	
Secondary heating system: N/A	
Fuel	N/A
Efficiency	N/A
Commissioning	

5 Hot water	
Cylinder/store - type: Cylinder	
Capacity	210 litres
Declared heat loss	1.58 kWh/day
Primary pipework insulated	Yes
Manufacturer	
Model	
Commissioning	
Waste water heat recovery system 1 - type: N/A	
Efficiency	
Manufacturer	
Model	

6 Controls		
Main heating 1 - type: Programmer, room thermostat and TRVs		
Function		
Ecodesign class		
Manufacturer		
Model		
Water heating - type: Cylinder thermostat and HW separately timed		
Manufacturer		
Model		

7 Lighting		
Minimum permitted light source efficacy	*75 lm/W*	
Lowest light source efficacy	80 lm/W	OK
External lights control	N/A	

8 Mechanical ventilation		
System type: Balanced whole-house mechanical ventilation with heat recovery		
Maximum permitted specific fan power	*1.5 W/(l/s)*	
Specific fan power	0.97 W/(l/s)	OK
Minimum permitted heat recovery efficiency	*73%*	
Heat recovery efficiency	89%	OK
Manufacturer/Model	DV110 Adroit	
Commissioning		

9 Local generation
N/A

10 Heat networks
N/A

11 Supporting documentary evidence	
Documentary evidence identified in 11.1 and 11.2 is needed to confirm the data values used for any calculations undertaken, manufacturer declarations made, and tests performed as reflected in this "As built" BREL Compliance Report are correct. 11.1 SAP Conventions, Appendix 1 (documentary evidence) schedules the minimum documentary evidence required. 11.2 Indicative photographic evidence of key stages during construction (guidance within Approved Document L, Volume 1 – Appendix B) that confirms the products identified in this BREL Compliance Report are used in this dwelling, and workmanship is of sufficient quality to support the calculated values claimed in 2a to 2d.	

12 Declarations	
a. Assessor Declaration	
This declaration by the assessor is confirmation that the contents of this BREL Compliance Report are a true and accurate reflection based upon the design and construction information submitted for this dwelling for the purpose of carrying out the assessment, and that the supporting documentary evidence (identified in 11.1 and 11.2) pursuant to Part L of the Building Regulations 2010 (as amended) has been reviewed in the course of preparing this BREL Compliance Report.	
Signed: Name:	Assessor ID: Date:
b. Client Declaration	
This declaration by the client is confirmation that the dwelling has been constructed and completed according to the specifications set out in this BREL Compliance Report, and that photographic evidence of key stages, as described in 11.2, has been provided to the Assessor for this dwelling.	
Signed: Name:	Organisation: Date:

Full SAP Calculation Printout

Property Reference	78449-09	**Issued on Date**	03/10/2025
Assessment Reference	001	**Prop Type Ref**	End
Property	838 Rochdale Road, MANCHESTER, M9 8FA		

SAP Rating	84 B	**DER**	3.38	**TER**	11.00
Environmental	97 A	**% DER < TER**			69.27
CO_2 Emissions (t/year)	0.39	**DFEE**	34.51	**TFEE**	39.76
Compliance Check	See BREL	**% DFEE < TFEE**			13.21
% DPER < TPER	38.07	**DPER**	35.71	**TPER**	57.67

Assessor Details	Mr. Daniel Goddard	**Assessor ID**	CP52-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.0600 (1b)	x	2.4800 (2b)	=	116.7088	(1b) - (3b)
First floor	49.7800 (1c)	x	2.7800 (2c)	=	138.3884	(1c) - (3c)
Second floor	23.4000 (1d)	x	2.7700 (2d)	=	64.8180	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	120.2400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	319.9152	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.2500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2125	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2709	0.2656	0.2603	0.2338	0.2284	0.2019	0.2019	0.1966	0.2125	0.2284	0.2391	0.2497	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	80.1000 (23c)

Effective ac	0.3704	0.3651	0.3598	0.3332	0.3279	0.3014	0.3014	0.2961	0.3120	0.3279	0.3386	0.3492	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door			4.1400	1.0000	4.1400			(26)
Window			12.4100	0.7752	9.6202			(27)
GF			47.0600	0.0900	4.2354	75.0000	3529.5000	(28a)
Exposed Floor			2.7200	0.1400	0.3808	20.0000	54.4000	(28b)
Main	136.0800	16.5500	119.5300	0.1300	15.5389	9.0000	1075.7700	(29a)
Dwarf Wall (PIRx0.72)	16.7700		16.7700	0.0900	1.5093	9.0000	150.9300	(29a)
PIJ	15.5100		15.5100	0.1300	2.0163	9.0000	139.5900	(30)
PIR	12.2300		12.2300	0.1300	1.5899	9.0000	110.0700	(30)
Residual Ceiling	26.3800		26.3800	0.0900	2.3742	9.0000	237.4200	(30)
Total net area of external elements Aum(A, m2)			256.7500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		41.4050			(33)
Main dwelling								
Party Wall 1			40.6300	0.0000	0.0000	20.0000	812.6000	(32)

Timber	124.1700		9.0000	1117.5300 (32c)
FF	47.0600		18.0000	847.0800 (32d)
SF	23.4000		18.0000	421.2000 (32d)
GF	47.0600		9.0000	423.5400 (32e)
FF	23.4000		9.0000	210.6000 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 9130.2300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 75.9334 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	11.3700	0.1150	1.3075
E3 Sill	11.3700	0.0170	0.1933
E4 Jamb	39.6000	0.0940	3.7224
E5 Ground floor (normal)	22.8600	0.0670	1.5316
E11 Eaves (insulation at rafter level)	18.1000	0.0250	0.4525
E16 Corner (normal)	29.0400	0.0680	1.9747
E12 Gable (insulation at ceiling level)	5.6600	0.0770	0.4358
E6 Intermediate floor within a dwelling	39.5500	0.0320	1.2656
E17 Corner (inverted - internal area greater than external area)	2.4800	-0.0290	-0.0719
P1 Party wall - Ground floor	6.2400	0.3200	1.9968
E20 Exposed floor (normal)	3.3800	0.0790	0.2670
E21 Exposed floor (inverted)	3.3800	0.0630	0.2129
E13 Gable (insulation at rafter level)	8.2800	0.0740	0.6127
E18 Party wall between dwellings	5.5600	0.0920	0.5115
R6 Flat ceiling	18.1000	-0.0430	-0.7783
E25 Staggered party wall between dwellings	4.9600	0.0560	0.2778

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 13.9120 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 55.3170 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	39.1078	38.5470	37.9861	35.1819	34.6210	31.8168	31.8168	31.2559	32.9385	34.6210	35.7427	36.8644	(38)
Heat transfer coeff	94.4248	93.8640	93.3031	90.4989	89.9380	87.1338	87.1338	86.5729	88.2555	89.9380	91.0597	92.1814	(39)
Average = Sum(39)m / 12 =												90.3587	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7853	0.7806	0.7760	0.7527	0.7480	0.7247	0.7247	0.7200	0.7340	0.7480	0.7573	0.7666	(40)
HLP (average)												0.7515	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.8642 (42)
Hot water usage for mixer showers

72.2437	71.1580	69.5759	66.5490	64.3151	61.8240	60.4080	61.9781	63.6992	66.3739	69.4659	71.9669	(42a)

Hot water usage for baths

31.1904	30.7271	30.0748	28.8721	27.9715	26.9729	26.4334	27.0812	27.7865	28.8550	30.0826	31.0849	(42b)

Hot water usage for other uses

43.9627	42.3640	40.7654	39.1667	37.5681	35.9694	35.9694	37.5681	39.1667	40.7654	42.3640	43.9627	(42c)

Average daily hot water use (litres/day) 135.4907 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	147.3967	144.2491	140.4161	134.5878	129.8547	124.7663	122.8109	126.6274	130.6524	135.9943	141.9125	147.0144	(44)
Energy conte	233.4403	205.4088	215.8143	184.2439	174.8094	153.4147	148.5292	156.7911	161.1075	184.5430	202.1803	230.1891	(45)
Energy content (annual)										Total = Sum(45)m =		2250.4717	
Distribution loss (46)m = 0.15 x (45)m	35.0160	30.8113	32.3722	27.6366	26.2214	23.0122	22.2794	23.5187	24.1661	27.6815	30.3271	34.5284	(46)
Water storage loss:													
Store volume												210.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5800	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8532	(55)
Total storage loss	26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(56)
If cylinder contains dedicated solar storage	26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	283.1519	250.3096	265.5259	232.3519	224.5210	201.5227	198.2408	206.5027	209.2155	234.2546	250.2883	279.9007	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	283.1519	250.3096	265.5259	232.3519	224.5210	201.5227	198.2408	206.5027	209.2155	234.2546	250.2883	279.9007	(64)
										Total per year (kWh/year) = Sum(64)m =		2835.7857	(64)
12Total per year (kWh/year)												2836	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	117.3882	104.2191	111.5276	99.7475	97.8934	89.4968	89.1552	91.9023	92.0546	101.1298	105.7114	116.3071	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	169.8151	188.0096	169.8151	175.4756	169.8151	175.4756	169.8151	169.8151	175.4756	169.8151	175.4756	169.8151	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	285.5253	288.4881	281.0218	265.1269	245.0625	226.2048	213.6066	210.6438	218.1101	234.0050	254.0694	272.9272	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	(71)
Water heating gains (Table 5)	157.7798	155.0879	149.9026	138.5382	131.5771	124.3011	119.8323	123.5246	127.8537	135.9272	146.8213	156.3268	(72)
Total internal gains	679.0838	697.5492	666.7031	645.1043	612.4183	591.9450	569.2176	569.9471	587.4029	605.7108	642.3299	665.0326	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	3.8000	10.6334	0.3000	0.0000	0.7700	9.3340	(74)
East	5.8000	19.6403	0.3000	0.0000	0.7700	26.3140	(76)
West	2.8100	19.6403	0.3000	0.0000	0.7700	12.7487	(80)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	48.3967	94.2527	156.1552	232.2235	290.5167	300.4683	284.7653	240.3082	182.8057	111.9063	60.2213	39.9046	(83)
Total gains	727.4805	791.8019	822.8583	877.3278	902.9350	892.4133	853.9829	810.2553	770.2086	717.6171	702.5512	704.9372	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	26.8592	27.0197	27.1821	28.0244	28.1991	29.1067	29.1067	29.2952	28.7367	28.1991	27.8518	27.5129	
alpha	2.7906	2.8013	2.8121	2.8683	2.8799	2.9404	2.9404	2.9530	2.9158	2.8799	2.8568	2.8342	
util living area	0.9343	0.9148	0.8861	0.8172	0.7132	0.5551	0.4244	0.4588	0.6519	0.8310	0.9077	0.9384	(86)
Living	18.9124	19.1651	19.5422	20.1063	20.5442	20.8508	20.9498	20.9365	20.7451	20.1970	19.5190	18.9174	
Non living	18.3285	18.5794	18.9521	19.5121	19.9261	20.2134	20.2906	20.2856	20.1209	19.6087	18.9446	18.3448	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	19.9320	19.1651	19.5422	20.1063	20.5442	20.8508	20.9498	20.9365	20.7451	20.1970	19.5190	19.2087	(87)
Th 2	20.2661	20.2701	20.2742	20.2946	20.2986	20.3191	20.3191	20.3232	20.3109	20.2986	20.2905	20.2823	(88)
util rest of house	0.9277	0.9064	0.8744	0.7980	0.6823	0.5090	0.3655	0.3999	0.6083	0.8097	0.8973	0.9323	(89)
MIT 2	19.2749	18.5794	18.9521	19.5121	19.9261	20.2134	20.2906	20.2856	20.1209	19.6087	18.9446	18.6159	(90)
Living area fraction										fLA = Living area / (4) =		0.2917	(91)
MIT	19.4666	18.7503	19.1242	19.6855	20.1065	20.3994	20.4829	20.4755	20.3030	19.7804	19.1122	18.7888	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4666	18.7503	19.1242	19.6855	20.1065	20.3994	20.4829	20.4755	20.3030	19.7804	19.1122	18.7888	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9195	0.8851	0.8525	0.7796	0.6733	0.5146	0.3800	0.4135	0.6077	0.7918	0.8766	0.9167	(94)
Useful gains	668.9196	700.8065	701.4834	683.9784	607.9012	459.2581	324.5501	335.0632	468.0898	568.2109	615.8902	646.2316	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1432.1056	1300.0427	1177.8797	976.0723	756.0598	505.3222	338.3329	352.8299	547.4524	825.6638	1093.8272	1344.8182	(97)
Space heating kWh	567.8104	402.6867	354.4388	210.3076	110.2300	0.0000	0.0000	0.0000	0.0000	191.5450	344.1147	519.7484	(98a)
Space heating requirement - total per year (kWh/year)												2700.8816	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	567.8104	402.6867	354.4388	210.3076	110.2300	0.0000	0.0000	0.0000	0.0000	191.5450	344.1147	519.7484	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2700.8816	
Space heating per m2											(98c) / (4) =	22.4624	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Efficiency of main space heating system 1 (in %)	282.0592 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	567.8104	402.6867	354.4388	210.3076	110.2300	0.0000	0.0000	0.0000	0.0000	191.5450	344.1147	519.7484	(98)
Space heating efficiency (main heating system 1)	282.0592	282.0592	282.0592	282.0592	282.0592	0.0000	0.0000	0.0000	0.0000	282.0592	282.0592	282.0592	(210)
Space heating fuel (main heating system)	201.3090	142.7668	125.6612	74.5615	39.0804	0.0000	0.0000	0.0000	0.0000	67.9095	122.0009	184.2693	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	283.1519	250.3096	265.5259	232.3519	224.5210	201.5227	198.2408	206.5027	209.2155	234.2546	250.2883	279.9007	(64)
Efficiency of water heater												279.7045	(216)
(217)m	279.7045	279.7045	279.7045	279.7045	279.7045	279.7045	279.7045	279.7045	279.7045	279.7045	279.7045	279.7045	(217)
Fuel for water heating, kWh/month	101.2325	89.4908	94.9309	83.0705	80.2708	72.0484	70.8751	73.8289	74.7988	83.7508	89.4831	100.0701	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	45.0156	40.6593	45.0156	43.5635	45.0156	43.5635	45.0156	45.0156	43.5635	45.0156	43.5635	45.0156	(231)
Lighting	35.7791	28.7033	25.8441	18.9345	14.6256	11.9492	13.3419	17.3423	22.5260	29.5553	33.3827	36.7735	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	957.5586	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	279.7045	
Water heating fuel used	1013.8507	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.3580)		
mechanical ventilation fans (SFP = 1.3580)	530.0227	(230a)
Total electricity for the above, kWh/year	530.0227	(231)
Electricity for lighting (calculated in Appendix L)	288.7576	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2790.1895	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	957.5586	0.1550	148.3968	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1013.8507	0.1410	142.9394	(264)
Space and water heating			291.3362	(265)
Pumps, fans and electric keep-hot	530.0227	0.1387	73.5207	(267)
Energy for lighting	288.7576	0.1443	41.6766	(268)
Total CO2, kg/year			406.5336	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.3800	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	957.5586	1.5737	1506.9341	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1013.8507	1.5213	1542.3932	(278)
Space and water heating			3049.3273	(279)
Pumps, fans and electric keep-hot	530.0227	1.5128	801.8183	(281)
Energy for lighting	288.7576	1.5338	442.9060	(282)
Total Primary energy kWh/year			4294.0516	(286)
Dwelling Primary energy Rate (DPER)			35.7100	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.0600 (1b)	x	2.4800 (2b)	=	116.7088	(1b) - (3b)
First floor	49.7800 (1c)	x	2.7800 (2c)	=	138.3884	(1c) - (3c)
Second floor	23.4000 (1d)	x	2.7700 (2d)	=	64.8180	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	120.2400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	319.9152	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	4 * 10 =	40.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1250	(8)
Pressure test		Yes	

Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.3750	(18)
Number of sides sheltered	2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3188	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4064	0.3985	0.3905	0.3507	0.3427	0.3028	0.3028	0.2949	0.3188	0.3427	0.3586	0.3746	(22b)
Effective ac	0.5826	0.5794	0.5762	0.5615	0.5587	0.5459	0.5459	0.5435	0.5508	0.5587	0.5643	0.5701	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			4.1400	1.0000	4.1400			(26)
TER Opening Type			12.4100	1.1450	14.2099			(27)
GF			47.0600	0.1300	6.1178			(28a)
Exposed Floor			2.7200	0.1300	0.3536			(28b)
Main	136.0800	16.5500	119.5300	0.1800	21.5154			(29a)
Dwarf Wall (PIRx0.72)	16.7700		16.7700	0.1800	3.0186			(29a)
PIJ	15.5100		15.5100	0.1100	1.7061			(30)
PIR	12.2300		12.2300	0.1100	1.3453			(30)
Residual Ceiling	26.3800		26.3800	0.1100	2.9018			(30)
Total net area of external elements Aum(A, m2)			256.7500					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	55.3085			(33)
Main dwelling								
Party Wall 1			40.6300	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	75.9334 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	11.3700	0.0500	0.5685
E3 Sill	11.3700	0.0500	0.5685
E4 Jamb	39.6000	0.0500	1.9800
E5 Ground floor (normal)	22.8600	0.1600	3.6576
E11 Eaves (insulation at rafter level)	18.1000	0.0400	0.7240
E16 Corner (normal)	29.0400	0.0900	2.6136
E12 Gable (insulation at ceiling level)	5.6600	0.0600	0.3396
E6 Intermediate floor within a dwelling	39.5500	0.0000	0.0000
E17 Corner (inverted - internal area greater than external area)	2.4800	-0.0900	-0.2232
P1 Party wall - Ground floor	6.2400	0.0800	0.4992
E20 Exposed floor (normal)	3.3800	0.3200	1.0816
E21 Exposed floor (inverted)	3.3800	0.3200	1.0816
E13 Gable (insulation at rafter level)	8.2800	0.0800	0.6624
E18 Party wall between dwellings	5.5600	0.0600	0.3336
R6 Flat ceiling	18.1000	0.0600	1.0860
E25 Staggered party wall between dwellings	4.9600	0.0600	0.2976

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	15.2706	(36)
Point Thermal bridges	(36a) = 0.0000	
Total fabric heat loss	(33) + (36) + (36a) = 70.5791	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	61.5060	61.1674	60.8355	59.2766	58.9849	57.6271	57.6271	57.3757	58.1501	58.9849	59.5749	60.1918	(38)
Heat transfer coeff	132.0851	131.7465	131.4146	129.8557	129.5640	128.2062	128.2062	127.9548	128.7292	129.5640	130.1541	130.7709	(39)
Average = Sum(39)m / 12 =												129.8543	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0985	1.0957	1.0929	1.0800	1.0775	1.0663	1.0663	1.0642	1.0706	1.0775	1.0825	1.0876	(40)
HLP (average)												1.0800	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.8642 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
72.2437	71.1580	69.5759	66.5490	64.3151	61.8240	60.4080	61.9781	63.6992	66.3739	69.4659	71.9669	(42a)

Hot water usage for baths

31.1904	30.7271	30.0748	28.8721	27.9715	26.9729	26.4334	27.0812	27.7865	28.8550	30.0826	31.0849	(42b)

Hot water usage for other uses

43.9627	42.3640	40.7654	39.1667	37.5681	35.9694	35.9694	37.5681	39.1667	40.7654	42.3640	43.9627	(42c)

Average daily hot water use (litres/day)	135.4907 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	147.3967	144.2491	140.4161	134.5878	129.8547	124.7663	122.8109	126.6274	130.6524	135.9943	141.9125	147.0144	(44)
Energy conte	233.4403	205.4088	215.8143	184.2439	174.8094	153.4147	148.5292	156.7911	161.1075	184.5430	202.1803	230.1891	(45)
Energy content (annual)										Total = Sum(45)m =		2250.4717	
Distribution loss (46)m = 0.15 x (45)m	35.0160	30.8113	32.3722	27.6366	26.2214	23.0122	22.2794	23.5187	24.1661	27.6815	30.3271	34.5284	(46)

Water storage loss:	
Store volume	210.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):	1.7016 (48)
Temperature factor from Table 2b	0.5400 (49)
Enter (49) or (54) in (55)	0.9188 (55)

Total storage loss

28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842	(56)

If cylinder contains dedicated solar storage

28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

285.1869	252.1477	267.5609	234.3213	226.5560	203.4920	200.2757	208.5377	211.1848	236.2896	252.2577	281.9357	(62)
WWHRS -33.0268	-29.2092	-30.5861	-25.3265	-23.6034	-20.1976	-18.9320	-20.1323	-20.8972	-24.6355	-27.9091	-32.4152	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

	252.1601	222.9385	236.9748	208.9947	202.9525	183.2944	181.3437	188.4054	190.2876	211.6541	224.3486	249.5205 (64)
										Total per year (kWh/year) = Sum(64)m =		2552.8750 (64)
12Total per year (kWh/year)												2553 (64)

Electric shower(s)

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000 (64a)

Heat gains from water heating, kWh/month

	119.0162	105.6895	113.1555	101.3230	99.5214	91.0723	90.7832	93.5303	93.6301	102.7578	107.2868	117.9351 (65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	165.1888	182.8876	165.1888	170.6951	165.1888	170.6951	165.1888	165.1888	170.6951	165.1888	170.6951	165.1888	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	285.5253	288.4881	281.0218	265.1269	245.0625	226.2048	213.6066	210.6438	218.1101	234.0050	254.0694	272.9272	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	(71)

Water heating gains (Table 5)

	159.9680	157.2761	152.0908	140.7264	133.7653	126.4893	122.0205	125.7128	130.0418	138.1154	149.0095	158.5150	(72)

Total internal gains

	679.6456	697.6153	667.2649	645.5119	612.9801	589.3526	566.7794	567.5089	584.8105	606.2727	642.7375	665.5945	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	3.8000	10.6334	0.6300	0.7000	0.7700	12.3489	(74)
East	5.8000	19.6403	0.6300	0.7000	0.7700	34.8135	(76)
West	2.8100	19.6403	0.6300	0.7000	0.7700	16.8665	(80)

Solar gains	64.0288	124.6963	206.5934	307.2317	384.3536	397.5196	376.7445	317.9277	241.8519	148.0520	79.6728	52.7937	(83)
Total gains	743.6744	822.3117	873.8583	952.7436	997.3337	986.8722	943.5239	885.4366	826.6624	754.3247	722.4103	718.3882	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	19.2011	19.2504	19.2990	19.5307	19.5747	19.7820	19.7820	19.8209	19.7016	19.5747	19.4859	19.3940	
alpha	2.2801	2.2834	2.2866	2.3020	2.3050	2.3188	2.3188	2.3214	2.3134	2.3050	2.2991	2.2929	
util living area	0.9428	0.9264	0.9013	0.8461	0.7602	0.6320	0.5088	0.5484	0.7229	0.8645	0.9235	0.9468	(86)
MIT	17.9526	18.2437	18.7307	19.4383	20.0873	20.5961	20.8274	20.7884	20.4044	19.5794	18.6717	17.9141	(87)
Th 2	20.0020	20.0043	20.0066	20.0172	20.0192	20.0285	20.0285	20.0302	20.0249	20.0192	20.0152	20.0110	(88)
util rest of house	0.9359	0.9175	0.8887	0.8250	0.7240	0.5704	0.4199	0.4614	0.6696	0.8417	0.9128	0.9404	(89)
MIT 2	16.4219	16.7905	17.4066	18.2951	19.0866	19.6781	19.9142	19.8827	19.4750	18.4845	17.3429	16.3774	(90)
Living area fraction									fLA = Living area / (4) =			0.2917	(91)
MIT	16.8684	17.2145	17.7929	18.6287	19.3785	19.9459	20.1807	20.1469	19.7462	18.8040	17.7306	16.8257	(92)
Temperature adjustment												0.0000	
adjusted MIT	16.8684	17.2145	17.7929	18.6287	19.3785	19.9459	20.1807	20.1469	19.7462	18.8040	17.7306	16.8257	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9047	0.8829	0.8515	0.7882	0.6966	0.5647	0.4348	0.4727	0.6522	0.8058	0.8785	0.9104	(94)
Useful gains	672.7951	726.0407	744.0560	750.9102	694.7035	557.2624	410.2462	418.5846	539.1090	607.8214	634.6352	654.0272	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1660.1053	1622.3906	1484.0572	1263.3208	994.8626	685.3812	459.0623	479.4362	726.8291	1062.9379	1383.6147	1651.0777	(97)
Space heating kWh	734.5588	602.3471	550.5609	368.9356	223.3184	0.0000	0.0000	0.0000	0.0000	338.6067	539.2652	741.8056	(98a)
Space heating requirement - total per year (kWh/year)												4099.3984	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	734.5588	602.3471	550.5609	368.9356	223.3184	0.0000	0.0000	0.0000	0.0000	338.6067	539.2652	741.8056	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4099.3984	
Space heating per m2											(98c) / (4) =	34.0935	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	734.5588	602.3471	550.5609	368.9356	223.3184	0.0000	0.0000	0.0000	0.0000	338.6067	539.2652	741.8056	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)

Space heating fuel (main heating system)

795.8384	652.5971	596.4906	399.7136	241.9485	0.0000	0.0000	0.0000	0.0000	366.8545	584.2527	803.6897	(211)

Space heating efficiency (main heating system 2)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)

Space heating fuel (main heating system 2)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)

Space heating fuel (secondary)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)

Water heating

Water heating requirement

252.1601	222.9385	236.9748	208.9947	202.9525	183.2944	181.3437	188.4054	190.2876	211.6541	224.3486	249.5205	(64)

Efficiency of water heater

											79.8000	(216)
(217)m	86.3123	86.1746	85.8853	85.3202	84.2747	79.8000	79.8000	79.8000	79.8000	85.1079	85.9520	86.3488	(217)

Fuel for water heating, kWh/month

292.1485	258.7057	275.9200	244.9533	240.8226	229.6923	227.2477	236.0970	238.4556	248.6890	261.0163	288.9682	(219)

Space cooling fuel requirement

(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	34.3230	27.5352	24.7924	18.1639	14.0304	11.4629	12.7990	16.6366	21.6093	28.3525	32.0241	35.2769	(232)

Electricity generated by PVs (Appendix M) (negative quantity)

(233a)m	-44.7840	-63.5097	-91.7765	-103.6989	-112.1734	-104.7546	-103.4242	-97.4733	-87.0199	-72.8443	-49.3556	-38.6717	(233a)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)

Electricity generated by PVs (Appendix M) (negative quantity)

(233b)m	-24.1211	-50.8952	-101.4703	-152.8736	-202.6272	-203.8335	-201.4723	-170.3819	-124.5894	-72.9794	-32.2632	-19.0653	(233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year

Space heating fuel - main system 1	4441.3850	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	3042.7161	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	277.0060	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-2326.0585	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	5521.0487	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	4441.3850	0.2100	932.6909	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3042.7161	0.2100	638.9704	(264)
Space and water heating			1571.6612	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	277.0060	0.1443	39.9805	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-969.4861	0.1345	-130.3861	
PV Unit electricity exported	-1356.5723	0.1258	-170.6553	
Total			-301.0414	(269)
Total CO2, kg/year			1322.5296	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.0000	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	4441.3850	1.1300	5018.7651	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3042.7161	1.1300	3438.2692	(278)
Space and water heating			8457.0343	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	277.0060	1.5338	424.8810	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-969.4861	1.4970	-1451.3661	
PV Unit electricity exported	-1356.5723	0.4618	-626.4154	
Total			-2077.7815	(283)
Total Primary energy kWh/year			6934.2347	(286)
Target Primary Energy Rate (TPER)			57.6700	(287)

Full SAP Calculation Printout

Property Reference	78449-09	**Issued on Date**	03/10/2025
Assessment Reference	001	**Prop Type Ref**	End
Property	838 Rochdale Road, MANCHESTER, M9 8FA		

SAP Rating	84 B	**DER**	3.38	**TER**	11.00
Environmental	97 A	**% DER < TER**			69.27
CO_2 Emissions (t/year)	0.39	**DFEE**	34.51	**TFEE**	39.76
Compliance Check	See BREL	**% DFEE < TFEE**			13.21
% DPER < TPER	38.07	**DPER**	35.71	**TPER**	57.67

Assessor Details	Mr. Daniel Goddard	**Assessor ID**	CP52-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.0600 (1b)	x	2.4800 (2b)	=	116.7088	(1b) - (3b)
First floor	49.7800 (1c)	x	2.7800 (2c)	=	138.3884	(1c) - (3c)
Second floor	23.4000 (1d)	x	2.7700 (2d)	=	64.8180	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	120.2400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	319.9152	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	4 * 10 =	40.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1250	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3750	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3188	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4064	0.3985	0.3905	0.3507	0.3427	0.3028	0.3028	0.2949	0.3188	0.3427	0.3586	0.3746	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5826	0.5794	0.5762	0.5615	0.5587	0.5459	0.5459	0.5435	0.5508	0.5587	0.5643	0.5701	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door			4.1400	1.0000	4.1400			(26)
Window			12.4100	0.7752	9.6202			(27)
GF			47.0600	0.0900	4.2354	75.0000	3529.5000	(28a)
Exposed Floor			2.7200	0.1400	0.3808	20.0000	54.4000	(28b)
Main	136.0800	16.5500	119.5300	0.1300	15.5389	9.0000	1075.7700	(29a)
Dwarf Wall (PIRx0.72)	16.7700		16.7700	0.0900	1.5093	9.0000	150.9300	(29a)
PIJ	15.5100		15.5100	0.1300	2.0163	9.0000	139.5900	(30)
PIR	12.2300		12.2300	0.1300	1.5899	9.0000	110.0700	(30)
Residual Ceiling	26.3800		26.3800	0.0900	2.3742	9.0000	237.4200	(30)
Total net area of external elements Aum(A, m2)			256.7500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		41.4050			(33)
Main dwelling								
Party Wall 1			40.6300	0.0000	0.0000	20.0000	812.6000	(32)
Timber			124.1700			9.0000	1117.5300	(32c)
FF			47.0600			18.0000	847.0800	(32d)
SF			23.4000			18.0000	421.2000	(32d)

GF	47.0600		9.0000	423.5400 (32e)
FF	23.4000		9.0000	210.6000 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 9130.2300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 75.9334 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	11.3700	0.1150	1.3075
E3 Sill	11.3700	0.0170	0.1933
E4 Jamb	39.6000	0.0940	3.7224
E5 Ground floor (normal)	22.8600	0.0670	1.5316
E11 Eaves (insulation at rafter level)	18.1000	0.0250	0.4525
E16 Corner (normal)	29.0400	0.0680	1.9747
E12 Gable (insulation at ceiling level)	5.6600	0.0770	0.4358
E6 Intermediate floor within a dwelling	39.5500	0.0320	1.2656
E17 Corner (inverted - internal area greater than external area)	2.4800	-0.0290	-0.0719
P1 Party wall - Ground floor	6.2400	0.3200	1.9968
E20 Exposed floor (normal)	3.3800	0.0790	0.2670
E21 Exposed floor (inverted)	3.3800	0.0630	0.2129
E13 Gable (insulation at rafter level)	8.2800	0.0740	0.6127
E18 Party wall between dwellings	5.5600	0.0920	0.5115
R6 Flat ceiling	18.1000	-0.0430	-0.7783
E25 Staggered party wall between dwellings	4.9600	0.0560	0.2778

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 13.9120 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 55.3170 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	61.5060	61.1674	60.8355	59.2766	58.9849	57.6271	57.6271	57.3757	58.1501	58.9849	59.5749	60.1918	(38)
Heat transfer coeff	116.8230	116.4844	116.1525	114.5936	114.3019	112.9441	112.9441	112.6927	113.4671	114.3019	114.8919	115.5088	(39)
Average = Sum(39)m / 12 =												114.5922	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9716	0.9688	0.9660	0.9530	0.9506	0.9393	0.9393	0.9372	0.9437	0.9506	0.9555	0.9607	(40)
HLP (average)												0.9530	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.8642 (42)
Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

31.1904	30.7271	30.0748	28.8721	27.9715	26.9729	26.4334	27.0812	27.7865	28.8550	30.0826	31.0849	(42b)

Hot water usage for other uses

43.9627	42.3640	40.7654	39.1667	37.5681	35.9694	35.9694	37.5681	39.1667	40.7654	42.3640	43.9627	(42c)

Average daily hot water use (litres/day) 68.8844 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	75.1530	73.0911	70.8402	68.0388	65.5396	62.9423	62.4029	64.6493	66.9532	69.6204	72.4466	75.0476	(44)
Energy conte	119.0240	104.0808	108.8787	93.1417	88.2288	77.3949	75.4709	80.0493	82.5600	94.4742	103.2134	117.5064	(45)
Energy content (annual)										Total = Sum(45)m =		1144.0232	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	101.1704	88.4687	92.5469	79.1705	74.9945	65.7857	64.1503	68.0419	70.1760	80.3031	87.7314	99.8804	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	101.1704	88.4687	92.5469	79.1705	74.9945	65.7857	64.1503	68.0419	70.1760	80.3031	87.7314	99.8804	(64)
										Total per year (kWh/year) = Sum(64)m =		972.4197	(64)
12Total per year (kWh/year)												972	(64)
Electric shower(s)	57.8551	51.5494	56.2900	53.7168	54.7248	52.2022	53.9422	54.7248	53.7168	56.2900	55.2315	57.8551	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		658.0987	(64a)
Heat gains from water heating, kWh/month	39.7564	35.0045	37.2092	33.2218	32.4298	29.4970	29.5231	30.6917	30.9732	34.1483	35.7407	39.4339	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	169.8151	188.0096	169.8151	175.4756	169.8151	175.4756	169.8151	169.8151	175.4756	169.8151	175.4756	169.8151	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	285.5253	288.4881	281.0218	265.1269	245.0625	226.2048	213.6066	210.6438	218.1101	234.0050	254.0694	272.9272	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	(71)
Water heating gains (Table 5)	53.4360	52.0901	50.0124	46.1414	43.5885	40.9680	39.6816	41.2523	43.0183	45.8982	49.6399	53.0025	(72)
Total internal gains	574.7399	594.5513	566.8129	552.7075	524.4297	508.6119	489.0669	487.6747	502.5676	515.6818	545.1485	561.7083	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	3.8000	10.6334	0.3000	0.0000	0.7700	9.3340	(74)
East	5.8000	19.6403	0.3000	0.0000	0.7700	26.3140	(76)
West	2.8100	19.6403	0.3000	0.0000	0.7700	12.7487	(80)

Solar gains	48.3967	94.2527	156.1552	232.2235	290.5167	300.4683	284.7653	240.3082	182.8057	111.9063	60.2213	39.9046	(83)
Total gains	623.1367	688.8040	722.9681	784.9310	814.9463	809.0802	773.8322	727.9829	685.3733	627.5881	605.3698	601.6129	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	21.7096	21.7727	21.8349	22.1319	22.1884	22.4551	22.4551	22.5052	22.3516	22.1884	22.0744	21.9566	
alpha	2.4473	2.4515	2.4557	2.4755	2.4792	2.4970	2.4970	2.5003	2.4901	2.4792	2.4716	2.4638	
util living area	0.9575	0.9439	0.9244	0.8769	0.7998	0.6728	0.5456	0.5859	0.7592	0.8913	0.9415	0.9608	(86)
MIT	18.1051	18.3778	18.8232	19.4952	20.1130	20.6130	20.8380	20.8007	20.4318	19.6423	18.7892	18.0736	(87)
Th 2	20.1071	20.1094	20.1118	20.1227	20.1247	20.1342	20.1342	20.1360	20.1305	20.1247	20.1206	20.1163	(88)
util rest of house	0.9525	0.9373	0.9149	0.8601	0.7693	0.6174	0.4628	0.5056	0.7129	0.8733	0.9335	0.9562	(89)
MIT 2	17.4285	17.6995	18.1412	18.8060	19.3998	19.8620	20.0452	20.0211	19.7071	18.9584	18.1168	17.4031	(90)
Living area fraction										fLA = Living area / (4) =		0.2917	(91)
MIT	17.6259	17.8974	18.3402	19.0071	19.6078	20.0811	20.2765	20.2486	19.9186	19.1579	18.3129	17.5987	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.6259	17.8974	18.3402	19.0071	19.6078	20.0811	20.2765	20.2486	19.9186	19.1579	18.3129	17.5987	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9334	0.9154	0.8903	0.8340	0.7485	0.6136	0.4773	0.5169	0.7000	0.8484	0.9116	0.9381	(94)
Useful gains	581.6141	630.5013	643.6789	654.6612	609.9560	496.4722	369.3746	376.3181	479.7711	532.4182	551.8551	564.3480	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1556.7708	1513.9916	1375.2636	1158.2063	903.8797	619.0552	415.2366	433.7036	660.2144	978.1850	1288.2761	1547.6684	(97)
Space heating kWh	725.5166	593.7055	544.2990	362.5525	218.6792	0.0000	0.0000	0.0000	0.0000	331.6505	530.2231	731.5903	(98a)
Space heating requirement - total per year (kWh/year)												4038.2166	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	725.5166	593.7055	544.2990	362.5525	218.6792	0.0000	0.0000	0.0000	0.0000	331.6505	530.2231	731.5903	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4038.2166	
Space heating per m2											(98c) / (4) =	33.5846	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	1061.6745	835.7863	856.4642	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.6343	0.7071	0.6753	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	673.3828	590.9699	578.3316	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	856.9763	819.7292	769.7286	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	132.1873	170.1969	142.3994	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	33.0468	42.5492	35.5998	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												111.1959	(107)
Energy for space heating												33.5846	(99)
Energy for space cooling												0.9248	(108)
Total												34.5094	(109)
Fabric Energy Efficiency (DFEE)												34.5	(109)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.0600 (1b)	x	2.4800 (2b)	=	116.7088	(1b) - (3b)
First floor	49.7800 (1c)	x	2.7800 (2c)	=	138.3884	(1c) - (3c)
Second floor	23.4000 (1d)	x	2.7700 (2d)	=	64.8180	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	120.2400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	319.9152	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	4 * 10 =	40.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1250	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3750	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3188	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4064	0.3985	0.3905	0.3507	0.3427	0.3028	0.3028	0.2949	0.3188	0.3427	0.3586	0.3746	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0.0000	(23c)
Effective ac	0.5701	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			4.1400	1.0000	4.1400			(26)
TER Opening Type			12.4100	1.1450	14.2099			(27)
GF			47.0600	0.1300	6.1178			(28a)
Exposed Floor			2.7200	0.1300	0.3536			(28b)
Main	136.0800	16.5500	119.5300	0.1800	21.5154			(29a)
Dwarf Wall (PIRx0.72)	16.7700		16.7700	0.1800	3.0186			(29a)
PIJ	15.5100		15.5100	0.1100	1.7061			(30)
PIR	12.2300		12.2300	0.1100	1.3453			(30)
Residual Ceiling	26.3800		26.3800	0.1100	2.9018			(30)
Total net area of external elements Aum(A, m2)			256.7500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		55.3085			(33)
Main dwelling								
Party Wall 1			40.6300	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	75.9334	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	11.3700	0.0500	0.5685
E3 Sill	11.3700	0.0500	0.5685
E4 Jamb	39.6000	0.0500	1.9800
E5 Ground floor (normal)	22.8600	0.1600	3.6576
E11 Eaves (insulation at rafter level)	18.1000	0.0400	0.7240
E16 Corner (normal)	29.0400	0.0900	2.6136
E12 Gable (insulation at ceiling level)	5.6600	0.0600	0.3396
E6 Intermediate floor within a dwelling	39.5500	0.0000	0.0000
E17 Corner (inverted - internal area greater than external area)	2.4800	-0.0900	-0.2232
P1 Party wall - Ground floor	6.2400	0.0800	0.4992
E20 Exposed floor (normal)	3.3800	0.3200	1.0816
E21 Exposed floor (inverted)	3.3800	0.3200	1.0816
E13 Gable (insulation at rafter level)	8.2800	0.0800	0.6624
E18 Party wall between dwellings	5.5600	0.0600	0.3336
R6 Flat ceiling	18.1000	0.0600	1.0860
E25 Staggered party wall between dwellings	4.9600	0.0600	0.2976

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		15.2706	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	70.5791	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	61.5060	61.1674	60.8355	59.2766	58.9849	57.6271	57.6271	57.3757	58.1501	58.9849	59.5749	60.1918	(38)
Heat transfer coeff	132.0851	131.7465	131.4146	129.8557	129.5640	128.2062	128.2062	127.9548	128.7292	129.5640	130.1541	130.7709	(39)
Average = Sum(39)m / 12 =												129.8543	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0985	1.0957	1.0929	1.0800	1.0775	1.0663	1.0663	1.0642	1.0706	1.0775	1.0825	1.0876	(40)
HLP (average)												1.0800	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.8642	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

31.1904	30.7271	30.0748	28.8721	27.9715	26.9729	26.4334	27.0812	27.7865	28.8550	30.0826	31.0849	(42b)

Hot water usage for other uses

43.9627	42.3640	40.7654	39.1667	37.5681	35.9694	35.9694	37.5681	39.1667	40.7654	42.3640	43.9627	(42c)

Average daily hot water use (litres/day)	68.8844	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	75.1530	73.0911	70.8402	68.0388	65.5396	62.9423	62.4029	64.6493	66.9532	69.6204	72.4466	75.0476	(44)
Energy conte	119.0240	104.0808	108.8787	93.1417	88.2288	77.3949	75.4709	80.0493	82.5600	94.4742	103.2134	117.5064	(45)

Energy content (annual) Total = Sum(45)m = 1144.0232
Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss:
Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

101.1704	88.4687	92.5469	79.1705	74.9945	65.7857	64.1503	68.0419	70.1760	80.3031	87.7314	99.8804	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

101.1704	88.4687	92.5469	79.1705	74.9945	65.7857	64.1503	68.0419	70.1760	80.3031	87.7314	99.8804	(64)

Total per year (kWh/year) = Sum(64)m = 972.4197 (64)
12Total per year (kWh/year) 972 (64)
Electric shower(s)

57.8551	51.5494	56.2900	53.7168	54.7248	52.2022	53.9422	54.7248	53.7168	56.2900	55.2315	57.8551	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 658.0987 (64a)
Heat gains from water heating, kWh/month

39.7564	35.0045	37.2092	33.2218	32.4298	29.4970	29.5231	30.6917	30.9732	34.1483	35.7407	39.4339	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

165.1888	182.8876	165.1888	170.6951	165.1888	170.6951	165.1888	165.1888	170.6951	165.1888	170.6951	165.1888	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

285.5253	288.4881	281.0218	265.1269	245.0625	226.2048	213.6066	210.6438	218.1101	234.0050	254.0694	272.9272	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	(71)

Water heating gains (Table 5)

53.4360	52.0901	50.0124	46.1414	43.5885	40.9680	39.6816	41.2523	43.0183	45.8982	49.6399	53.0025	(72)

Total internal gains

570.1136	589.4293	562.1866	547.9270	519.8033	503.8314	484.4406	483.0484	497.7870	511.0555	540.3679	557.0820	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	3.8000	10.6334	0.6300	0.7000	0.7700	12.3489	(74)
East	5.8000	19.6403	0.6300	0.7000	0.7700	34.8135	(76)
West	2.8100	19.6403	0.6300	0.7000	0.7700	16.8665	(80)

Solar gains	64.0288	124.6963	206.5934	307.2317	384.3536	397.5196	376.7445	317.9277	241.8519	148.0520	79.6728	52.7937	(83)
Total gains	634.1425	714.1257	768.7799	855.1587	904.1569	901.3509	861.1850	800.9761	739.6390	659.1075	620.0407	609.8757	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	19.2011	19.2504	19.2990	19.5307	19.5747	19.7820	19.7820	19.8209	19.7016	19.5747	19.4859	19.3940	
alpha	2.2801	2.2834	2.2866	2.3020	2.3050	2.3188	2.3188	2.3214	2.3134	2.3050	2.2991	2.2929	
util living area													
	0.9578	0.9432	0.9211	0.8703	0.7899	0.6652	0.5427	0.5861	0.7592	0.8915	0.9423	0.9612	(86)
MIT	17.7626	18.0648	18.5694	19.3120	19.9974	20.5466	20.8015	20.7552	20.3306	19.4476	18.5026	17.7229	(87)
Th 2	20.0020	20.0043	20.0066	20.0172	20.0192	20.0285	20.0285	20.0302	20.0249	20.0192	20.0152	20.0110	(88)
util rest of house													
	0.9525	0.9360	0.9106	0.8515	0.7560	0.6045	0.4516	0.4977	0.7088	0.8721	0.9338	0.9563	(89)
MIT 2	17.0248	17.3248	17.8246	18.5571	19.2136	19.7183	19.9245	19.8949	19.5364	18.7003	17.7685	16.9910	(90)
Living area fraction										fLA = Living area / (4) =		0.2917	(91)
MIT	17.2401	17.5407	18.0419	18.7773	19.4423	19.9599	20.1803	20.1459	19.7681	18.9183	17.9827	17.2046	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.2401	17.5407	18.0419	18.7773	19.4423	19.9599	20.1803	20.1459	19.7681	18.9183	17.9827	17.2046	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9318	0.9119	0.8832	0.8223	0.7328	0.5997	0.4670	0.5092	0.6934	0.8443	0.9099	0.9368	(94)
Useful gains	590.8759	651.2196	678.9977	703.2307	662.5275	540.5400	402.1422	407.8888	512.8940	556.4864	564.2015	571.3053	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1709.1935	1665.3685	1516.7724	1282.6275	1003.1246	687.1742	459.0198	479.3039	729.6500	1077.7569	1416.4215	1700.6186	(97)
Space heating kWh													
	832.0283	681.5081	623.3044	417.1658	253.4042	0.0000	0.0000	0.0000	0.0000	387.8253	613.5984	840.2091	(98a)

Space heating requirement - total per year (kWh/year) 4649.0435
Solar heating kWh

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)

Solar heating contribution - total per year (kWh/year) 0.0000
Space heating kWh

832.0283	681.5081	623.3044	417.1658	253.4042	0.0000	0.0000	0.0000	0.0000	387.8253	613.5984	840.2091	(98c)

Space heating requirement after solar contribution - total per year (kWh/year) 4649.0435
Space heating per m2 (98c) / (4) = 38.6647 (99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	1205.1385	948.7260	972.4563	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.6200	0.6905	0.6549	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	747.1592	655.0732	636.8557	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	970.0081	926.7999	859.8842	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	160.4512	202.1647	165.9332	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	40.1128	50.5412	41.4833	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												132.1373	(107)
Energy for space heating												38.6647	(99)
Energy for space cooling												1.0989	(108)
Total												39.7636	(109)
Fabric Energy Efficiency (TFEE)												39.8	(109)

Full SAP Calculation Printout

Property Reference	78449-09	**Issued on Date**	03/10/2025
Assessment Reference	001	**Prop Type Ref**	End
Property	838 Rochdale Road, MANCHESTER, M9 8FA		

SAP Rating	84 B	**DER**	3.38	**TER**	11.00
Environmental	97 A	**% DER < TER**			69.27
CO_2 Emissions (t/year)	0.39	**DFEE**	34.51	**TFEE**	39.76
Compliance Check	See BREL	**% DFEE < TFEE**			13.21
% DPER < TPER	38.07	**DPER**	35.71	**TPER**	57.67

Assessor Details	Mr. Daniel Goddard	**Assessor ID**	CP52-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.0600 (1b)	x	2.4800 (2b)	=	116.7088	(1b) - (3b)
First floor	49.7800 (1c)	x	2.7800 (2c)	=	138.3884	(1c) - (3c)
Second floor	23.4000 (1d)	x	2.7700 (2d)	=	64.8180	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	120.2400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	319.9152	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.2500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2125	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2709	0.2656	0.2603	0.2338	0.2284	0.2019	0.2019	0.1966	0.2125	0.2284	0.2391	0.2497	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	80.1000 (23c)

Effective ac	0.3704	0.3651	0.3598	0.3332	0.3279	0.3014	0.3014	0.2961	0.3120	0.3279	0.3386	0.3492	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door			4.1400	1.0000	4.1400			(26)
Window			12.4100	0.7752	9.6202			(27)
GF			47.0600	0.0900	4.2354	75.0000	3529.5000	(28a)
Exposed Floor			2.7200	0.1400	0.3808	20.0000	54.4000	(28b)
Main	136.0800	16.5500	119.5300	0.1300	15.5389	9.0000	1075.7700	(29a)
Dwarf Wall (PIRx0.72)	16.7700		16.7700	0.0900	1.5093	9.0000	150.9300	(29a)
PIJ	15.5100		15.5100	0.1300	2.0163	9.0000	139.5900	(30)
PIR	12.2300		12.2300	0.1300	1.5899	9.0000	110.0700	(30)
Residual Ceiling	26.3800		26.3800	0.0900	2.3742	9.0000	237.4200	(30)
Total net area of external elements Aum(A, m2)			256.7500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		41.4050			(33)
Main dwelling								
Party Wall 1			40.6300	0.0000	0.0000	20.0000	812.6000	(32)

Timber	124.1700		9.0000	1117.5300 (32c)
FF	47.0600		18.0000	847.0800 (32d)
SF	23.4000		18.0000	421.2000 (32d)
GF	47.0600		9.0000	423.5400 (32e)
FF	23.4000		9.0000	210.6000 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 9130.2300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 75.9334 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	11.3700	0.1150	1.3075
E3 Sill	11.3700	0.0170	0.1933
E4 Jamb	39.6000	0.0940	3.7224
E5 Ground floor (normal)	22.8600	0.0670	1.5316
E11 Eaves (insulation at rafter level)	18.1000	0.0250	0.4525
E16 Corner (normal)	29.0400	0.0680	1.9747
E12 Gable (insulation at ceiling level)	5.6600	0.0770	0.4358
E6 Intermediate floor within a dwelling	39.5500	0.0320	1.2656
E17 Corner (inverted - internal area greater than external area)	2.4800	-0.0290	-0.0719
P1 Party wall - Ground floor	6.2400	0.3200	1.9968
E20 Exposed floor (normal)	3.3800	0.0790	0.2670
E21 Exposed floor (inverted)	3.3800	0.0630	0.2129
E13 Gable (insulation at rafter level)	8.2800	0.0740	0.6127
E18 Party wall between dwellings	5.5600	0.0920	0.5115
R6 Flat ceiling	18.1000	-0.0430	-0.7783
E25 Staggered party wall between dwellings	4.9600	0.0560	0.2778

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 13.9120 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 55.3170 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	39.1078	38.5470	37.9861	35.1819	34.6210	31.8168	31.8168	31.2559	32.9385	34.6210	35.7427	36.8644	(38)
Heat transfer coeff	94.4248	93.8640	93.3031	90.4989	89.9380	87.1338	87.1338	86.5729	88.2555	89.9380	91.0597	92.1814	(39)
Average = Sum(39)m / 12 =												90.3587	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7853	0.7806	0.7760	0.7527	0.7480	0.7247	0.7247	0.7200	0.7340	0.7480	0.7573	0.7666	(40)
HLP (average)												0.7515	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.8642 (42)
Hot water usage for mixer showers

72.2437	71.1580	69.5759	66.5490	64.3151	61.8240	60.4080	61.9781	63.6992	66.3739	69.4659	71.9669	(42a)

Hot water usage for baths

31.1904	30.7271	30.0748	28.8721	27.9715	26.9729	26.4334	27.0812	27.7865	28.8550	30.0826	31.0849	(42b)

Hot water usage for other uses

43.9627	42.3640	40.7654	39.1667	37.5681	35.9694	35.9694	37.5681	39.1667	40.7654	42.3640	43.9627	(42c)

Average daily hot water use (litres/day) 135.4907 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	147.3967	144.2491	140.4161	134.5878	129.8547	124.7663	122.8109	126.6274	130.6524	135.9943	141.9125	147.0144	(44)
Energy conte	233.4403	205.4088	215.8143	184.2439	174.8094	153.4147	148.5292	156.7911	161.1075	184.5430	202.1803	230.1891	(45)
Energy content (annual)										Total = Sum(45)m =		2250.4717	
Distribution loss (46)m = 0.15 x (45)m	35.0160	30.8113	32.3722	27.6366	26.2214	23.0122	22.2794	23.5187	24.1661	27.6815	30.3271	34.5284	(46)
Water storage loss:													
Store volume												210.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5800	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8532	(55)
Total storage loss	26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(56)
If cylinder contains dedicated solar storage	26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	283.1519	250.3096	265.5259	232.3519	224.5210	201.5227	198.2408	206.5027	209.2155	234.2546	250.2883	279.9007	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	283.1519	250.3096	265.5259	232.3519	224.5210	201.5227	198.2408	206.5027	209.2155	234.2546	250.2883	279.9007	(64)
										Total per year (kWh/year) = Sum(64)m =		2835.7857	(64)
12Total per year (kWh/year)												2836	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	117.3882	104.2191	111.5276	99.7475	97.8934	89.4968	89.1552	91.9023	92.0546	101.1298	105.7114	116.3071	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	169.8151	188.0096	169.8151	175.4756	169.8151	175.4756	169.8151	169.8151	175.4756	169.8151	175.4756	169.8151	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	285.5253	288.4881	281.0218	265.1269	245.0625	226.2048	213.6066	210.6438	218.1101	234.0050	254.0694	272.9272	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	(71)
Water heating gains (Table 5)	157.7798	155.0879	149.9026	138.5382	131.5771	124.3011	119.8323	123.5246	127.8537	135.9272	146.8213	156.3268	(72)
Total internal gains	679.0838	697.5492	666.7031	645.1043	612.4183	591.9450	569.2176	569.9471	587.4029	605.7108	642.3299	665.0326	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	3.8000	10.6334	0.3000	0.0000	0.7700	9.3340	(74)
East	5.8000	19.6403	0.3000	0.0000	0.7700	26.3140	(76)
West	2.8100	19.6403	0.3000	0.0000	0.7700	12.7487	(80)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	48.3967	94.2527	156.1552	232.2235	290.5167	300.4683	284.7653	240.3082	182.8057	111.9063	60.2213	39.9046	(83)
Total gains	727.4805	791.8019	822.8583	877.3278	902.9350	892.4133	853.9829	810.2553	770.2086	717.6171	702.5512	704.9372	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	26.8592	27.0197	27.1821	28.0244	28.1991	29.1067	29.1067	29.2952	28.7367	28.1991	27.8518	27.5129	
alpha	2.7906	2.8013	2.8121	2.8683	2.8799	2.9404	2.9404	2.9530	2.9158	2.8799	2.8568	2.8342	
util living area	0.9343	0.9148	0.8861	0.8172	0.7132	0.5551	0.4244	0.4588	0.6519	0.8310	0.9077	0.9384	(86)
Living	18.9124	19.1651	19.5422	20.1063	20.5442	20.8508	20.9498	20.9365	20.7451	20.1970	19.5190	18.9174	
Non living	18.3285	18.5794	18.9521	19.5121	19.9261	20.2134	20.2906	20.2856	20.1209	19.6087	18.9446	18.3448	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	19.9320	19.1651	19.5422	20.1063	20.5442	20.8508	20.9498	20.9365	20.7451	20.1970	19.5190	19.2087	(87)
Th 2	20.2661	20.2701	20.2742	20.2946	20.2986	20.3191	20.3191	20.3232	20.3109	20.2986	20.2905	20.2823	(88)
util rest of house	0.9277	0.9064	0.8744	0.7980	0.6823	0.5090	0.3655	0.3999	0.6083	0.8097	0.8973	0.9323	(89)
MIT 2	19.2749	18.5794	18.9521	19.5121	19.9261	20.2134	20.2906	20.2856	20.1209	19.6087	18.9446	18.6159	(90)
Living area fraction										fLA = Living area / (4) =		0.2917	(91)
MIT	19.4666	18.7503	19.1242	19.6855	20.1065	20.3994	20.4829	20.4755	20.3030	19.7804	19.1122	18.7888	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4666	18.7503	19.1242	19.6855	20.1065	20.3994	20.4829	20.4755	20.3030	19.7804	19.1122	18.7888	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9195	0.8851	0.8525	0.7796	0.6733	0.5146	0.3800	0.4135	0.6077	0.7918	0.8766	0.9167	(94)
Useful gains	668.9196	700.8065	701.4834	683.9784	607.9012	459.2581	324.5501	335.0632	468.0898	568.2109	615.8902	646.2316	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1432.1056	1300.0427	1177.8797	976.0723	756.0598	505.3222	338.3329	352.8299	547.4524	825.6638	1093.8272	1344.8182	(97)
Space heating kWh	567.8104	402.6867	354.4388	210.3076	110.2300	0.0000	0.0000	0.0000	0.0000	191.5450	344.1147	519.7484	(98a)
Space heating requirement - total per year (kWh/year)												2700.8816	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	567.8104	402.6867	354.4388	210.3076	110.2300	0.0000	0.0000	0.0000	0.0000	191.5450	344.1147	519.7484	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2700.8816	
Space heating per m2											(98c) / (4) =	22.4624	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Efficiency of main space heating system 1 (in %)	282.0592 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	567.8104	402.6867	354.4388	210.3076	110.2300	0.0000	0.0000	0.0000	0.0000	191.5450	344.1147	519.7484	(98)
Space heating efficiency (main heating system 1)	282.0592	282.0592	282.0592	282.0592	282.0592	0.0000	0.0000	0.0000	0.0000	282.0592	282.0592	282.0592	(210)
Space heating fuel (main heating system)	201.3090	142.7668	125.6612	74.5615	39.0804	0.0000	0.0000	0.0000	0.0000	67.9095	122.0009	184.2693	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	283.1519	250.3096	265.5259	232.3519	224.5210	201.5227	198.2408	206.5027	209.2155	234.2546	250.2883	279.9007	(64)
Efficiency of water heater												279.7045	(216)
(217)m	279.7045	279.7045	279.7045	279.7045	279.7045	279.7045	279.7045	279.7045	279.7045	279.7045	279.7045	279.7045	(217)
Fuel for water heating, kWh/month	101.2325	89.4908	94.9309	83.0705	80.2708	72.0484	70.8751	73.8289	74.7988	83.7508	89.4831	100.0701	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	45.0156	40.6593	45.0156	43.5635	45.0156	43.5635	45.0156	45.0156	43.5635	45.0156	43.5635	45.0156	(231)
Lighting	35.7791	28.7033	25.8441	18.9345	14.6256	11.9492	13.3419	17.3423	22.5260	29.5553	33.3827	36.7735	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	957.5586	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	279.7045	
Water heating fuel used	1013.8507	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.3580)		
mechanical ventilation fans (SFP = 1.3580)	530.0227	(230a)
Total electricity for the above, kWh/year	530.0227	(231)
Electricity for lighting (calculated in Appendix L)	288.7576	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2790.1895	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	957.5586	0.1550	148.3968	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1013.8507	0.1410	142.9394	(264)
Space and water heating			291.3362	(265)
Pumps, fans and electric keep-hot	530.0227	0.1387	73.5207	(267)
Energy for lighting	288.7576	0.1443	41.6766	(268)
Total CO2, kg/year			406.5336	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.3800	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	957.5586	1.5737	1506.9341	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1013.8507	1.5213	1542.3932	(278)
Space and water heating			3049.3273	(279)
Pumps, fans and electric keep-hot	530.0227	1.5128	801.8183	(281)
Energy for lighting	288.7576	1.5338	442.9060	(282)
Total Primary energy kWh/year			4294.0516	(286)
Dwelling Primary energy Rate (DPER)			35.7100	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.0600 (1b)	x	2.4800 (2b)	=	116.7088	(1b) - (3b)
First floor	49.7800 (1c)	x	2.7800 (2c)	=	138.3884	(1c) - (3c)
Second floor	23.4000 (1d)	x	2.7700 (2d)	=	64.8180	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	120.2400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	319.9152	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	4 * 10 =	40.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1250	(8)
Pressure test		Yes	

Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.3750	(18)
Number of sides sheltered	2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3188	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4064	0.3985	0.3905	0.3507	0.3427	0.3028	0.3028	0.2949	0.3188	0.3427	0.3586	0.3746	(22b)
Effective ac	0.5826	0.5794	0.5762	0.5615	0.5587	0.5459	0.5459	0.5435	0.5508	0.5587	0.5643	0.5701	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			4.1400	1.0000	4.1400			(26)
TER Opening Type			12.4100	1.1450	14.2099			(27)
GF			47.0600	0.1300	6.1178			(28a)
Exposed Floor			2.7200	0.1300	0.3536			(28b)
Main	136.0800	16.5500	119.5300	0.1800	21.5154			(29a)
Dwarf Wall (PIRx0.72)	16.7700		16.7700	0.1800	3.0186			(29a)
PIJ	15.5100		15.5100	0.1100	1.7061			(30)
PIR	12.2300		12.2300	0.1100	1.3453			(30)
Residual Ceiling	26.3800		26.3800	0.1100	2.9018			(30)
Total net area of external elements Aum(A, m2)			256.7500					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	55.3085			(33)
Main dwelling								
Party Wall 1			40.6300	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	75.9334 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	11.3700	0.0500	0.5685
E3 Sill	11.3700	0.0500	0.5685
E4 Jamb	39.6000	0.0500	1.9800
E5 Ground floor (normal)	22.8600	0.1600	3.6576
E11 Eaves (insulation at rafter level)	18.1000	0.0400	0.7240
E16 Corner (normal)	29.0400	0.0900	2.6136
E12 Gable (insulation at ceiling level)	5.6600	0.0600	0.3396
E6 Intermediate floor within a dwelling	39.5500	0.0000	0.0000
E17 Corner (inverted - internal area greater than external area)	2.4800	-0.0900	-0.2232
P1 Party wall - Ground floor	6.2400	0.0800	0.4992
E20 Exposed floor (normal)	3.3800	0.3200	1.0816
E21 Exposed floor (inverted)	3.3800	0.3200	1.0816
E13 Gable (insulation at rafter level)	8.2800	0.0800	0.6624
E18 Party wall between dwellings	5.5600	0.0600	0.3336
R6 Flat ceiling	18.1000	0.0600	1.0860
E25 Staggered party wall between dwellings	4.9600	0.0600	0.2976

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	15.2706	(36)
Point Thermal bridges	(36a) = 0.0000	
Total fabric heat loss	(33) + (36) + (36a) = 70.5791	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	61.5060	61.1674	60.8355	59.2766	58.9849	57.6271	57.6271	57.3757	58.1501	58.9849	59.5749	60.1918	(38)
Heat transfer coeff	132.0851	131.7465	131.4146	129.8557	129.5640	128.2062	128.2062	127.9548	128.7292	129.5640	130.1541	130.7709	(39)
Average = Sum(39)m / 12 =												129.8543	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0985	1.0957	1.0929	1.0800	1.0775	1.0663	1.0663	1.0642	1.0706	1.0775	1.0825	1.0876	(40)
HLP (average)												1.0800	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.8642 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
72.2437	71.1580	69.5759	66.5490	64.3151	61.8240	60.4080	61.9781	63.6992	66.3739	69.4659	71.9669	(42a)

Hot water usage for baths

31.1904	30.7271	30.0748	28.8721	27.9715	26.9729	26.4334	27.0812	27.7865	28.8550	30.0826	31.0849	(42b)

Hot water usage for other uses

43.9627	42.3640	40.7654	39.1667	37.5681	35.9694	35.9694	37.5681	39.1667	40.7654	42.3640	43.9627	(42c)

Average daily hot water use (litres/day)	135.4907 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	147.3967	144.2491	140.4161	134.5878	129.8547	124.7663	122.8109	126.6274	130.6524	135.9943	141.9125	147.0144	(44)
Energy conte	233.4403	205.4088	215.8143	184.2439	174.8094	153.4147	148.5292	156.7911	161.1075	184.5430	202.1803	230.1891	(45)
Energy content (annual)										Total = Sum(45)m =		2250.4717	
Distribution loss (46)m = 0.15 x (45)m	35.0160	30.8113	32.3722	27.6366	26.2214	23.0122	22.2794	23.5187	24.1661	27.6815	30.3271	34.5284	(46)

Water storage loss:	
Store volume	210.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):	1.7016 (48)
Temperature factor from Table 2b	0.5400 (49)
Enter (49) or (54) in (55)	0.9188 (55)

Total storage loss

28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842	(56)

If cylinder contains dedicated solar storage

28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

285.1869	252.1477	267.5609	234.3213	226.5560	203.4920	200.2757	208.5377	211.1848	236.2896	252.2577	281.9357	(62)
WWHRS -33.0268	-29.2092	-30.5861	-25.3265	-23.6034	-20.1976	-18.9320	-20.1323	-20.8972	-24.6355	-27.9091	-32.4152	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

	252.1601	222.9385	236.9748	208.9947	202.9525	183.2944	181.3437	188.4054	190.2876	211.6541	224.3486	249.5205 (64)
										Total per year (kWh/year) = Sum(64)m =		2552.8750 (64)
12Total per year (kWh/year)												2553 (64)

Electric shower(s)

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000 (64a)

Heat gains from water heating, kWh/month

	119.0162	105.6895	113.1555	101.3230	99.5214	91.0723	90.7832	93.5303	93.6301	102.7578	107.2868	117.9351 (65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	165.1888	182.8876	165.1888	170.6951	165.1888	170.6951	165.1888	165.1888	170.6951	165.1888	170.6951	165.1888	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	285.5253	288.4881	281.0218	265.1269	245.0625	226.2048	213.6066	210.6438	218.1101	234.0050	254.0694	272.9272	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	(71)

Water heating gains (Table 5)

	159.9680	157.2761	152.0908	140.7264	133.7653	126.4893	122.0205	125.7128	130.0418	138.1154	149.0095	158.5150	(72)

Total internal gains

	679.6456	697.6153	667.2649	645.5119	612.9801	589.3526	566.7794	567.5089	584.8105	606.2727	642.7375	665.5945	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	3.8000	10.6334	0.6300	0.7000	0.7700	12.3489	(74)
East	5.8000	19.6403	0.6300	0.7000	0.7700	34.8135	(76)
West	2.8100	19.6403	0.6300	0.7000	0.7700	16.8665	(80)

Solar gains	64.0288	124.6963	206.5934	307.2317	384.3536	397.5196	376.7445	317.9277	241.8519	148.0520	79.6728	52.7937	(83)
Total gains	743.6744	822.3117	873.8583	952.7436	997.3337	986.8722	943.5239	885.4366	826.6624	754.3247	722.4103	718.3882	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	19.2011	19.2504	19.2990	19.5307	19.5747	19.7820	19.7820	19.8209	19.7016	19.5747	19.4859	19.3940	
alpha	2.2801	2.2834	2.2866	2.3020	2.3050	2.3188	2.3188	2.3214	2.3134	2.3050	2.2991	2.2929	
util living area	0.9428	0.9264	0.9013	0.8461	0.7602	0.6320	0.5088	0.5484	0.7229	0.8645	0.9235	0.9468	(86)
MIT	17.9526	18.2437	18.7307	19.4383	20.0873	20.5961	20.8274	20.7884	20.4044	19.5794	18.6717	17.9141	(87)
Th 2	20.0020	20.0043	20.0066	20.0172	20.0192	20.0285	20.0285	20.0302	20.0249	20.0192	20.0152	20.0110	(88)
util rest of house	0.9359	0.9175	0.8887	0.8250	0.7240	0.5704	0.4199	0.4614	0.6696	0.8417	0.9128	0.9404	(89)
MIT 2	16.4219	16.7905	17.4066	18.2951	19.0866	19.6781	19.9142	19.8827	19.4750	18.4845	17.3429	16.3774	(90)
Living area fraction									fLA = Living area / (4) =			0.2917	(91)
MIT	16.8684	17.2145	17.7929	18.6287	19.3785	19.9459	20.1807	20.1469	19.7462	18.8040	17.7306	16.8257	(92)
Temperature adjustment												0.0000	
adjusted MIT	16.8684	17.2145	17.7929	18.6287	19.3785	19.9459	20.1807	20.1469	19.7462	18.8040	17.7306	16.8257	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9047	0.8829	0.8515	0.7882	0.6966	0.5647	0.4348	0.4727	0.6522	0.8058	0.8785	0.9104	(94)
Useful gains	672.7951	726.0407	744.0560	750.9102	694.7035	557.2624	410.2462	418.5846	539.1090	607.8214	634.6352	654.0272	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1660.1053	1622.3906	1484.0572	1263.3208	994.8626	685.3812	459.0623	479.4362	726.8291	1062.9379	1383.6147	1651.0777	(97)
Space heating kWh	734.5588	602.3471	550.5609	368.9356	223.3184	0.0000	0.0000	0.0000	0.0000	338.6067	539.2652	741.8056	(98a)
Space heating requirement - total per year (kWh/year)												4099.3984	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	734.5588	602.3471	550.5609	368.9356	223.3184	0.0000	0.0000	0.0000	0.0000	338.6067	539.2652	741.8056	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4099.3984	
Space heating per m2											(98c) / (4) =	34.0935	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	734.5588	602.3471	550.5609	368.9356	223.3184	0.0000	0.0000	0.0000	0.0000	338.6067	539.2652	741.8056	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)

Space heating fuel (main heating system)

795.8384	652.5971	596.4906	399.7136	241.9485	0.0000	0.0000	0.0000	0.0000	366.8545	584.2527	803.6897	(211)

Space heating efficiency (main heating system 2)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)

Space heating fuel (main heating system 2)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)

Space heating fuel (secondary)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)

Water heating

Water heating requirement

252.1601	222.9385	236.9748	208.9947	202.9525	183.2944	181.3437	188.4054	190.2876	211.6541	224.3486	249.5205	(64)

Efficiency of water heater

											79.8000	(216)
(217)m	86.3123	86.1746	85.8853	85.3202	84.2747	79.8000	79.8000	79.8000	79.8000	85.1079	85.9520	86.3488	(217)

Fuel for water heating, kWh/month

292.1485	258.7057	275.9200	244.9533	240.8226	229.6923	227.2477	236.0970	238.4556	248.6890	261.0163	288.9682	(219)

Space cooling fuel requirement

(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	34.3230	27.5352	24.7924	18.1639	14.0304	11.4629	12.7990	16.6366	21.6093	28.3525	32.0241	35.2769	(232)

Electricity generated by PVs (Appendix M) (negative quantity)

(233a)m	-44.7840	-63.5097	-91.7765	-103.6989	-112.1734	-104.7546	-103.4242	-97.4733	-87.0199	-72.8443	-49.3556	-38.6717	(233a)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)

Electricity generated by PVs (Appendix M) (negative quantity)

(233b)m	-24.1211	-50.8952	-101.4703	-152.8736	-202.6272	-203.8335	-201.4723	-170.3819	-124.5894	-72.9794	-32.2632	-19.0653	(233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year

Space heating fuel - main system 1	4441.3850	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	3042.7161	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	277.0060	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-2326.0585	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	5521.0487	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	4441.3850	0.2100	932.6909	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3042.7161	0.2100	638.9704	(264)
Space and water heating			1571.6612	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	277.0060	0.1443	39.9805	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-969.4861	0.1345	-130.3861	
PV Unit electricity exported	-1356.5723	0.1258	-170.6553	
Total			-301.0414	(269)
Total CO2, kg/year			1322.5296	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.0000	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	4441.3850	1.1300	5018.7651	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3042.7161	1.1300	3438.2692	(278)
Space and water heating			8457.0343	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	277.0060	1.5338	424.8810	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-969.4861	1.4970	-1451.3661	
PV Unit electricity exported	-1356.5723	0.4618	-626.4154	
Total			-2077.7815	(283)
Total Primary energy kWh/year			6934.2347	(286)
Target Primary Energy Rate (TPER)			57.6700	(287)

Full SAP Calculation Printout

Property Reference	78449-09	**Issued on Date**	03/10/2025
Assessment Reference	001	**Prop Type Ref**	End
Property	838 Rochdale Road, MANCHESTER, M9 8FA		

SAP Rating	84 B	**DER**	3.38	**TER**	11.00
Environmental	97 A	**% DER < TER**			69.27
CO_2 Emissions (t/year)	0.39	**DFEE**	34.51	**TFEE**	39.76
Compliance Check	See BREL	**% DFEE < TFEE**			13.21
% DPER < TPER	38.07	**DPER**	35.71	**TPER**	57.67

Assessor Details	Mr. Daniel Goddard	**Assessor ID**	CP52-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.0600 (1b)	x	2.4800 (2b)	=	116.7088	(1b) - (3b)
First floor	49.7800 (1c)	x	2.7800 (2c)	=	138.3884	(1c) - (3c)
Second floor	23.4000 (1d)	x	2.7700 (2d)	=	64.8180	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	120.2400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	319.9152	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.2500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2125	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2709	0.2656	0.2603	0.2338	0.2284	0.2019	0.2019	0.1966	0.2125	0.2284	0.2391	0.2497	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	80.1000 (23c)

Effective ac	0.3704	0.3651	0.3598	0.3332	0.3279	0.3014	0.3014	0.2961	0.3120	0.3279	0.3386	0.3492	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door			4.1400	1.0000	4.1400			(26)
Window			12.4100	0.7752	9.6202			(27)
GF			47.0600	0.0900	4.2354	75.0000	3529.5000	(28a)
Exposed Floor			2.7200	0.1400	0.3808	20.0000	54.4000	(28b)
Main	136.0800	16.5500	119.5300	0.1300	15.5389	9.0000	1075.7700	(29a)
Dwarf Wall (PIRx0.72)	16.7700		16.7700	0.0900	1.5093	9.0000	150.9300	(29a)
PIJ	15.5100		15.5100	0.1300	2.0163	9.0000	139.5900	(30)
PIR	12.2300		12.2300	0.1300	1.5899	9.0000	110.0700	(30)
Residual Ceiling	26.3800		26.3800	0.0900	2.3742	9.0000	237.4200	(30)
Total net area of external elements Aum(A, m2)			256.7500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		41.4050			(33)
Main dwelling								
Party Wall 1			40.6300	0.0000	0.0000	20.0000	812.6000	(32)

Timber	124.1700		9.0000	1117.5300 (32c)
FF	47.0600		18.0000	847.0800 (32d)
SF	23.4000		18.0000	421.2000 (32d)
GF	47.0600		9.0000	423.5400 (32e)
FF	23.4000		9.0000	210.6000 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 9130.2300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 75.9334 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	11.3700	0.1150	1.3075
E3 Sill	11.3700	0.0170	0.1933
E4 Jamb	39.6000	0.0940	3.7224
E5 Ground floor (normal)	22.8600	0.0670	1.5316
E11 Eaves (insulation at rafter level)	18.1000	0.0250	0.4525
E16 Corner (normal)	29.0400	0.0680	1.9747
E12 Gable (insulation at ceiling level)	5.6600	0.0770	0.4358
E6 Intermediate floor within a dwelling	39.5500	0.0320	1.2656
E17 Corner (inverted - internal area greater than external area)	2.4800	-0.0290	-0.0719
P1 Party wall - Ground floor	6.2400	0.3200	1.9968
E20 Exposed floor (normal)	3.3800	0.0790	0.2670
E21 Exposed floor (inverted)	3.3800	0.0630	0.2129
E13 Gable (insulation at rafter level)	8.2800	0.0740	0.6127
E18 Party wall between dwellings	5.5600	0.0920	0.5115
R6 Flat ceiling	18.1000	-0.0430	-0.7783
E25 Staggered party wall between dwellings	4.9600	0.0560	0.2778

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 13.9120 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 55.3170 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	39.1078	38.5470	37.9861	35.1819	34.6210	31.8168	31.8168	31.2559	32.9385	34.6210	35.7427	36.8644	(38)
Heat transfer coeff	94.4248	93.8640	93.3031	90.4989	89.9380	87.1338	87.1338	86.5729	88.2555	89.9380	91.0597	92.1814	(39)

Average = Sum(39)m / 12 = 90.3587

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7853	0.7806	0.7760	0.7527	0.7480	0.7247	0.7247	0.7200	0.7340	0.7480	0.7573	0.7666	(40)
HLP (average)												0.7515	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.8642 (42)
Hot water usage for mixer showers

72.2437	71.1580	69.5759	66.5490	64.3151	61.8240	60.4080	61.9781	63.6992	66.3739	69.4659	71.9669	(42a)

Hot water usage for baths

31.1904	30.7271	30.0748	28.8721	27.9715	26.9729	26.4334	27.0812	27.7865	28.8550	30.0826	31.0849	(42b)

Hot water usage for other uses

43.9627	42.3640	40.7654	39.1667	37.5681	35.9694	35.9694	37.5681	39.1667	40.7654	42.3640	43.9627	(42c)

Average daily hot water use (litres/day) 135.4907 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	147.3967	144.2491	140.4161	134.5878	129.8547	124.7663	122.8109	126.6274	130.6524	135.9943	141.9125	147.0144	(44)
Energy conte	233.4403	205.4088	215.8143	184.2439	174.8094	153.4147	148.5292	156.7911	161.1075	184.5430	202.1803	230.1891	(45)
Energy content (annual)										Total = Sum(45)m =		2250.4717	
Distribution loss (46)m = 0.15 x (45)m	35.0160	30.8113	32.3722	27.6366	26.2214	23.0122	22.2794	23.5187	24.1661	27.6815	30.3271	34.5284	(46)
Water storage loss:													
Store volume												210.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5800	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8532	(55)
Total storage loss	26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(56)
If cylinder contains dedicated solar storage	26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	283.1519	250.3096	265.5259	232.3519	224.5210	201.5227	198.2408	206.5027	209.2155	234.2546	250.2883	279.9007	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	283.1519	250.3096	265.5259	232.3519	224.5210	201.5227	198.2408	206.5027	209.2155	234.2546	250.2883	279.9007	(64)
										Total per year (kWh/year) = Sum(64)m =		2835.7857	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	117.3882	104.2191	111.5276	99.7475	97.8934	89.4968	89.1552	91.9023	92.0546	101.1298	105.7114	116.3071	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	40.8766	36.3063	29.5262	22.3533	16.7093	14.1067	15.2428	19.8132	26.5932	33.7662	39.4101	42.0127	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	426.1571	430.5793	419.4356	395.7119	365.7649	337.6190	318.8159	314.3937	325.5374	349.2611	379.2081	407.3540	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	(71)
Water heating gains (Table 5)	157.7798	155.0879	149.9026	138.5382	131.5771	124.3011	119.8323	123.5246	127.8537	135.9272	146.8213	156.3268	(72)
Total internal gains	737.1480	734.3079	711.1988	668.9377	626.3858	588.3612	566.2253	570.0659	592.3187	631.2889	677.7739	718.0279	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	3.8000	10.6334	0.3000	0.0000	0.7700	9.3340	(74)
East	5.8000	19.6403	0.3000	0.0000	0.7700	26.3140	(76)
West	2.8100	19.6403	0.3000	0.0000	0.7700	12.7487	(80)

Solar gains	48.3967	94.2527	156.1552	232.2235	290.5167	300.4683	284.7653	240.3082	182.8057	111.9063	60.2213	39.9046	(83)
Total gains	785.5447	828.5606	867.3540	901.1612	916.9025	888.8296	850.9906	810.3741	775.1244	743.1952	737.9952	757.9324	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	26.8592	27.0197	27.1821	28.0244	28.1991	29.1067	29.1067	29.2952	28.7367	28.1991	27.8518	27.5129	
alpha	2.7906	2.8013	2.8121	2.8683	2.8799	2.9404	2.9404	2.9530	2.9158	2.8799	2.8568	2.8342	
util living area	0.9227	0.9066	0.8741	0.8088	0.7073	0.5568	0.4257	0.4588	0.6493	0.8205	0.8980	0.9280	(86)
Living	19.0174	19.2276	19.6099	20.1345	20.5548	20.8496	20.9494	20.9365	20.7479	20.2288	19.5779	19.0155	
Non living	18.4309	18.6399	19.0168	19.5382	19.9353	20.2125	20.2903	20.2857	20.1232	19.6379	19.0013	18.4407	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	19.9858	19.2276	19.6099	20.1345	20.5548	20.8496	20.9494	20.9365	20.7479	20.2288	19.5779	19.2931	(87)
Th 2	20.2661	20.2701	20.2742	20.2946	20.2986	20.3191	20.3191	20.3232	20.3109	20.2986	20.2905	20.2823	(88)
util rest of house	0.9152	0.8975	0.8615	0.7892	0.6762	0.5106	0.3667	0.3998	0.6056	0.7984	0.8868	0.9210	(89)
MIT 2	19.3273	18.6399	19.0168	19.5382	19.9353	20.2125	20.2903	20.2857	20.1232	19.6379	19.0013	18.6983	(90)
Living area fraction										fLA = Living area / (4) =		0.2917	(91)
MIT	19.5194	18.8114	19.1898	19.7121	20.1161	20.3984	20.4826	20.4755	20.3054	19.8103	19.1696	18.8718	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5194	18.8114	19.1898	19.7121	20.1161	20.3984	20.4826	20.4755	20.3054	19.8103	19.1696	18.8718	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9065	0.8757	0.8395	0.7712	0.6675	0.5162	0.3812	0.4135	0.6053	0.7811	0.8658	0.9045	(94)
Useful gains	712.0916	725.6116	728.1784	694.9561	612.0421	458.8050	324.4123	335.0704	469.1466	580.4736	638.9691	685.5214	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1437.0894	1305.7782	1184.0018	978.4848	756.9249	505.2358	338.3076	352.8312	547.6639	828.3572	1099.0501	1352.4694	(97)
Space heating kWh	539.3984	389.8719	339.1326	204.1407	107.7928	0.0000	0.0000	0.0000	0.0000	184.4254	331.2583	496.2093	(98a)
Space heating requirement - total per year (kWh/year)												2592.2293	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	539.3984	389.8719	339.1326	204.1407	107.7928	0.0000	0.0000	0.0000	0.0000	184.4254	331.2583	496.2093	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2592.2293	
Space heating per m2											(98c) / (4) =	21.5588	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	282.0592	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	539.3984	389.8719	339.1326	204.1407	107.7928	0.0000	0.0000	0.0000	0.0000	184.4254	331.2583	496.2093	(98)
Space heating efficiency (main heating system 1)	282.0592	282.0592	282.0592	282.0592	282.0592	0.0000	0.0000	0.0000	0.0000	282.0592	282.0592	282.0592	(210)
Space heating fuel (main heating system)	191.2359	138.2235	120.2346	72.3751	38.2164	0.0000	0.0000	0.0000	0.0000	65.3854	117.4428	175.9238	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	283.1519	250.3096	265.5259	232.3519	224.5210	201.5227	198.2408	206.5027	209.2155	234.2546	250.2883	279.9007	(64)
Efficiency of water heater												279.7045	(216)
(217)m	279.7045	279.7045	279.7045	279.7045	279.7045	279.7045	279.7045	279.7045	279.7045	279.7045	279.7045	279.7045	(217)
Fuel for water heating, kWh/month	101.2325	89.4908	94.9309	83.0705	80.2708	72.0484	70.8751	73.8289	74.7988	83.7508	89.4831	100.0701	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	45.0156	40.6593	45.0156	43.5635	45.0156	43.5635	45.0156	45.0156	43.5635	45.0156	43.5635	45.0156	(231)
Lighting	35.7791	28.7033	25.8441	18.9345	14.6256	11.9492	13.3419	17.3423	22.5260	29.5553	33.3827	36.7735	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													

(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	919.0374	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	279.7045	
Water heating fuel used	1013.8507	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.3580)		
mechanical ventilation fans (SFP = 1.3580)	530.0227	(230a)
Total electricity for the above, kWh/year	530.0227	(231)
Electricity for lighting (calculated in Appendix L)	288.7576	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2751.6684	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	919.0374	16.4900	151.5493	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1013.8507	16.4900	167.1840	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	530.0227	16.4900	87.4007	(249)
Energy for lighting	288.7576	16.4900	47.6161	(250)
Additional standing charges			0.0000	(251)
Total energy cost			453.7501	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):	0.3600	(256)
Energy cost factor (ECF) [(255) x (256)] / [(4) + 45.0] =	0.9886	(257)
SAP value	83.9754	
SAP rating (Section 12)	84	(258)
SAP band	B	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	919.0374	0.1549	142.3792	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1013.8507	0.1410	142.9394	(264)
Space and water heating			285.3186	(265)
Pumps, fans and electric keep-hot	530.0227	0.1387	73.5207	(267)
Energy for lighting	288.7576	0.1443	41.6766	(268)
Total CO2, kg/year			400.5159	(272)
CO2 emissions per m2			3.3300	(273)
EI value			96.7520	
EI rating			97	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)			Volume (m3)	
Main dwelling							
Ground floor	47.0600	(1b)	x 2.4800	(2b)	=	116.7088	(1b) - (3b)
First floor	49.7800	(1c)	x 2.7800	(2c)	=	138.3884	(1c) - (3c)
Second floor	23.4000	(1d)	x 2.7700	(2d)	=	64.8180	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	120.2400						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)		=	319.9152	(5)

2. Ventilation rate

m3 per hour

Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.2500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2125	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.6000	4.5000	4.5000	4.1000	4.2000	3.7000	3.5000	3.5000	3.7000	4.1000	4.1000	4.2000	(22)
Wind factor	1.1500	1.1250	1.1250	1.0250	1.0500	0.9250	0.8750	0.8750	0.9250	1.0250	1.0250	1.0500	(22a)
Adj infilt rate	0.2444	0.2391	0.2391	0.2178	0.2231	0.1966	0.1859	0.1859	0.1966	0.2178	0.2178	0.2231	(22b)
Balanced mechanical ventilation with heat recovery													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												80.1000	(23c)
Effective ac	0.3439	0.3386	0.3386	0.3173	0.3226	0.2961	0.2854	0.2854	0.2961	0.3173	0.3173	0.3226	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Door			4.1400	1.0000	4.1400			(26)
Window			12.4100	0.7752	9.6202			(27)
GF			47.0600	0.0900	4.2354	75.0000	3529.5000	(28a)
Exposed Floor			2.7200	0.1400	0.3808	20.0000	54.4000	(28b)
Main	136.0800	16.5500	119.5300	0.1300	15.5389	9.0000	1075.7700	(29a)
Dwarf Wall (PIRx0.72)	16.7700		16.7700	0.0900	1.5093	9.0000	150.9300	(29a)
PIJ	15.5100		15.5100	0.1300	2.0163	9.0000	139.5900	(30)
PIR	12.2300		12.2300	0.1300	1.5899	9.0000	110.0700	(30)
Residual Ceiling	26.3800		26.3800	0.0900	2.3742	9.0000	237.4200	(30)
Total net area of external elements Aum(A, m2)			256.7500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		41.4050			(33)
Main dwelling								
Party Wall 1			40.6300	0.0000	0.0000	20.0000	812.6000	(32)
Timber			124.1700			9.0000	1117.5300	(32c)
FF			47.0600			18.0000	847.0800	(32d)
SF			23.4000			18.0000	421.2000	(32d)
GF			47.0600			9.0000	423.5400	(32e)
FF			23.4000			9.0000	210.6000	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	9130.2300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		75.9334 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	11.3700	0.1150	1.3075
E3 Sill	11.3700	0.0170	0.1933
E4 Jamb	39.6000	0.0940	3.7224
E5 Ground floor (normal)	22.8600	0.0670	1.5316
E11 Eaves (insulation at rafter level)	18.1000	0.0250	0.4525
E16 Corner (normal)	29.0400	0.0680	1.9747
E12 Gable (insulation at ceiling level)	5.6600	0.0770	0.4358
E6 Intermediate floor within a dwelling	39.5500	0.0320	1.2656
E17 Corner (inverted - internal area greater than external area)	2.4800	-0.0290	-0.0719
P1 Party wall - Ground floor	6.2400	0.3200	1.9968
E20 Exposed floor (normal)	3.3800	0.0790	0.2670
E21 Exposed floor (inverted)	3.3800	0.0630	0.2129
E13 Gable (insulation at rafter level)	8.2800	0.0740	0.6127
E18 Party wall between dwellings	5.5600	0.0920	0.5115
R6 Flat ceiling	18.1000	-0.0430	-0.7783
E25 Staggered party wall between dwellings	4.9600	0.0560	0.2778

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		13.9120 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	55.3170 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	36.3036	35.7427	35.7427	33.4993	34.0602	31.2559	30.1342	30.1342	31.2559	33.4993	33.4993	34.0602	(38)
Heat transfer coeff	91.6206	91.0597	91.0597	88.8163	89.3772	86.5729	85.4512	85.4512	86.5729	88.8163	88.8163	89.3772	(39)
Average = Sum(39)m / 12 =												88.5826	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7620	0.7573	0.7573	0.7387	0.7433	0.7200	0.7107	0.7107	0.7200	0.7387	0.7387	0.7433	(40)
HLP (average)												0.7367	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.8642 (42)

Hot water usage for mixer showers

72.2437	71.1580	69.5759	66.5490	64.3151	61.8240	60.4080	61.9781	63.6992	66.3739	69.4659	71.9669	(42a)

Hot water usage for baths

31.1904	30.7271	30.0748	28.8721	27.9715	26.9729	26.4334	27.0812	27.7865	28.8550	30.0826	31.0849	(42b)

Hot water usage for other uses

43.9627	42.3640	40.7654	39.1667	37.5681	35.9694	35.9694	37.5681	39.1667	40.7654	42.3640	43.9627	(42c)

Average daily hot water use (litres/day)		135.4907 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	147.3967	144.2491	140.4161	134.5878	129.8547	124.7663	122.8109	126.6274	130.6524	135.9943	141.9125	147.0144	(44)
Energy conte	233.4403	205.4088	215.8143	184.2439	174.8094	153.4147	148.5292	156.7911	161.1075	184.5430	202.1803	230.1891	(45)
Energy content (annual)											Total = Sum(45)m =	2250.4717	
Distribution loss (46)m = 0.15 x (45)m													
	35.0160	30.8113	32.3722	27.6366	26.2214	23.0122	22.2794	23.5187	24.1661	27.6815	30.3271	34.5284	(46)
Water storage loss:													
Store volume												210.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5800	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8532	(55)
Total storage loss													
	26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(56)
If cylinder contains dedicated solar storage													
	26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	283.1519	250.3096	265.5259	232.3519	224.5210	201.5227	198.2408	206.5027	209.2155	234.2546	250.2883	279.9007	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	283.1519	250.3096	265.5259	232.3519	224.5210	201.5227	198.2408	206.5027	209.2155	234.2546	250.2883	279.9007	(64)
										Total per year (kWh/year) = Sum(64)m =		2835.7857	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	117.3882	104.2191	111.5276	99.7475	97.8934	89.4968	89.1552	91.9023	92.0546	101.1298	105.7114	116.3071	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	40.8766	36.3063	29.5262	22.3533	16.7093	14.1067	15.2428	19.8132	26.5932	33.7662	39.4101	42.0127	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	426.1571	430.5793	419.4356	395.7119	365.7649	337.6190	318.8159	314.3937	325.5374	349.2611	379.2081	407.3540	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	(71)
Water heating gains (Table 5)													
	157.7798	155.0879	149.9026	138.5382	131.5771	124.3011	119.8323	123.5246	127.8537	135.9272	146.8213	156.3268	(72)
Total internal gains													
	737.1480	734.3079	711.1988	668.9377	626.3858	588.3612	566.2253	570.0659	592.3187	631.2889	677.7739	718.0279	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	3.8000	8.9975	0.3000	0.0000	0.7700	7.8980	(74)
East	5.8000	16.6187	0.3000	0.0000	0.7700	22.2657	(76)
West	2.8100	16.6187	0.3000	0.0000	0.7700	10.7874	(80)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	40.9511	83.7802	146.3955	221.3864	270.8463	285.4449	265.1782	220.4100	173.2680	103.4285	52.9217	36.1041	(83)
Total gains	778.0990	818.0881	857.5943	890.3241	897.2321	873.8061	831.4036	790.4759	765.5867	734.7174	730.6956	754.1320	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	27.6813	27.8518	27.8518	28.5553	28.3761	29.2952	29.6798	29.6798	29.2952	28.5553	28.5553	28.3761	
alpha	2.8454	2.8568	2.8568	2.9037	2.8917	2.9530	2.9787	2.9787	2.9530	2.9037	2.9037	2.8917	
util living area													
	0.9184	0.9018	0.8706	0.7982	0.6878	0.5349	0.4279	0.4555	0.6484	0.8158	0.8916	0.9232	(86)
Living	19.1676	19.3683	19.6900	20.2183	20.6189	20.8751	20.9512	20.9410	20.7576	20.2706	19.6971	19.1728	
Non living	18.5932	18.7927	19.1068	19.6278	19.9976	20.2373	20.3035	20.2969	20.1423	19.6841	19.1297	18.6101	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.0626	19.3683	19.6900	20.2183	20.6189	20.8751	20.9512	20.9410	20.7576	20.2706	19.6971	19.4284	(87)
Th 2	20.2864	20.2905	20.2905	20.3068	20.3027	20.3232	20.3314	20.3314	20.3232	20.3068	20.3068	20.3027	(88)
util rest of house													
	0.9105	0.8922	0.8577	0.7775	0.6540	0.4865	0.3696	0.3961	0.6053	0.7931	0.8797	0.9157	(89)
MIT 2	19.4202	18.7927	19.1068	19.6278	19.9976	20.2373	20.3035	20.2969	20.1423	19.6841	19.1297	18.8469	(90)
Living area fraction										fLA = Living area / (4) =		0.2917	(91)
MIT	19.6076	18.9607	19.2769	19.8001	20.1789	20.4234	20.4925	20.4848	20.3218	19.8552	19.2952	19.0166	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6076	18.9607	19.2769	19.8001	20.1789	20.4234	20.4925	20.4848	20.3218	19.8552	19.2952	19.0166	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9019	0.8710	0.8365	0.7608	0.6476	0.4939	0.3840	0.4101	0.6052	0.7764	0.8592	0.8994	(94)
Useful gains	701.8028	712.5277	717.3628	677.3709	581.0190	431.5611	319.2364	324.1584	463.3497	570.4597	627.8397	678.2500	(95)
Ext temp.	4.7000	5.3000	6.7000	9.3000	12.3000	15.0000	16.6000	16.5000	14.1000	10.8000	7.5000	4.6000	(96)

Heat loss rate W

1365.8469	1243.9367	1145.2510	932.5772	704.1920	469.5173	332.6155	340.5050	538.6399	804.2505	1047.6091	1288.5105	(97)

Space heating kWh

494.0488	357.1068	318.3488	183.7486	91.6407	0.0000	0.0000	0.0000	0.0000	173.9403	302.2340	454.0338	(98a)

Space heating requirement - total per year (kWh/year) 2375.1018

Solar heating kWh

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)

Solar heating contribution - total per year (kWh/year) 0.0000

Space heating kWh

494.0488	357.1068	318.3488	183.7486	91.6407	0.0000	0.0000	0.0000	0.0000	173.9403	302.2340	454.0338	(98c)

Space heating requirement after solar contribution - total per year (kWh/year) 2375.1018

Space heating per m2 (98c) / (4) = 19.7530 (99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (201)

Fraction of space heat from main system(s) 1.0000 (202)

Efficiency of main space heating system 1 (in %) 281.2207 (206)

Efficiency of main space heating system 2 (in %) 0.0000 (207)

Efficiency of secondary/supplementary heating system, % 0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	494.0488	357.1068	318.3488	183.7486	91.6407	0.0000	0.0000	0.0000	0.0000	173.9403	302.2340	454.0338	(98)
Space heating efficiency (main heating system 1)													
	281.2207	281.2207	281.2207	281.2207	0.0000	0.0000	0.0000	0.0000	281.2207	281.2207	281.2207		(210)
Space heating fuel (main heating system)													
	175.6801	126.9846	113.2025	65.3396	32.5868	0.0000	0.0000	0.0000	0.0000	61.8519	107.4722	161.4511	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	283.1519	250.3096	265.5259	232.3519	224.5210	201.5227	198.2408	206.5027	209.2155	234.2546	250.2883	279.9007	(64)
Efficiency of water heater												279.7126	(216)
(217)m	279.7126	279.7126	279.7126	279.7126	279.7126	279.7126	279.7126	279.7126	279.7126	279.7126	279.7126	279.7126	(217)
Fuel for water heating, kWh/month													
	101.2296	89.4882	94.9281	83.0681	80.2685	72.0464	70.8730	73.8268	74.7966	83.7483	89.4805	100.0672	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	45.0156	40.6593	45.0156	43.5635	45.0156	43.5635	45.0156	45.0156	43.5635	45.0156	43.5635	45.0156	(231)
Lighting	35.7791	28.7033	25.8441	18.9345	14.6256	11.9492	13.3419	17.3423	22.5260	29.5553	33.3827	36.7735	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year

Space heating fuel - main system 1 844.5687 (211)

Space heating fuel - main system 2 0.0000 (213)

Space heating fuel - secondary 0.0000 (215)

Efficiency of water heater 279.7126

Water heating fuel used 1013.8213 (219)

Space cooling fuel 0.0000 (221)

Electricity for pumps and fans:

(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.3580)

mechanical ventilation fans (SFP = 1.3580) 530.0227 (230a)

Total electricity for the above, kWh/year 530.0227 (231)

Electricity for lighting (calculated in Appendix L) 288.7576 (232)

Energy saving/generation technologies (Appendices M ,N and Q)

PV generation 0.0000 (233)

Wind generation 0.0000 (234)

Hydro-electric generation (Appendix N) 0.0000 (235a)

Electricity generated - Micro CHP (Appendix N) 0.0000 (235)

Appendix Q - special features

Energy saved or generated -0.0000 (236)

Energy used 0.0000 (237)

Total delivered energy for all uses 2677.1702 (238)

10a. Fuel costs - using BEDF prices (583)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	844.5687	28.4300	240.1109	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1013.8213	28.4300	288.2294	(247)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(247a)
Pumps, fans and electric keep-hot	530.0227	28.4300	150.6855	(249)
Energy for lighting	288.7576	28.4300	82.0938	(250)
Additional standing charges			0.0000	(251)
Total energy cost			761.1195	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy	Emission factor	Emissions	

	kWh/year	kg CO2/kWh	kg CO2/year	
Space heating - main system 1	844.5687	0.1550	130.8751	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1013.8213	0.1410	142.9353	(264)
Space and water heating			273.8103	(265)
Pumps, fans and electric keep-hot	530.0227	0.1387	73.5207	(267)
Energy for lighting	288.7576	0.1443	41.6766	(268)
Total CO2, kg/year			389.0076	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	844.5687	1.5737	1329.0880	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1013.8213	1.5213	1542.3485	(278)
Space and water heating			2871.4364	(279)
Pumps, fans and electric keep-hot	530.0227	1.5128	801.8183	(281)
Energy for lighting	288.7576	1.5338	442.9060	(282)
Total Primary energy kWh/year			4116.1607	(286)

SAP 10 EPC IMPROVEMENTS

001

Current energy efficiency rating: B 84
Current environmental impact rating: A 97

N Solar water heating		Recommended
U Solar photovoltaic panels		Recommended
V2 Wind turbine		Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
N Solar water heating	+ 1.2	-£ 54	-23 kg (6.0%)
U Solar photovoltaic panels	+ 6.9	-£ 289	-207 kg (56.6%)

	Typical annual savings		Energy efficiency	Environmental impact
Recommended measures				
Solar water heating	£54	0.19 kg/m²	B 85	A 97
Solar photovoltaic panels	£289	1.72 kg/m²	A 92	A 99
Total Savings	£342	1.91 kg/m²		

Potential energy efficiency rating: A 92
Potential environmental impact rating: A 99

Fuel prices for cost data on this page from database revision number 583 TEST (01 Oct 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, West Pennines (England)):

	Current	Potential	Saving
Electricity	£761	£708	£54
Space heating	£391	£417	-£26
Water heating	£288	£209	£79
Lighting	£82	£82	£0
Generated (PV)	-£0	-£289	£289
Total cost of fuels	£761	£419	£343
Total cost of uses	£761	£419	£342
Delivered energy	22 kWh/m²	7 kWh/m²	15 kWh/m²
Carbon dioxide emissions	0.4 tonnes	0.2 tonnes	0.2 tonnes
CO2 emissions per m²	3 kg/m²	1 kg/m²	2 kg/m²
Primary energy	34 kWh/m²	18 kWh/m²	16 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.0600 (1b)	x	2.4800 (2b)	=	116.7088	(1b) - (3b)
First floor	49.7800 (1c)	x	2.7800 (2c)	=	138.3884	(1c) - (3c)
Second floor	23.4000 (1d)	x	2.7700 (2d)	=	64.8180	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	120.2400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	319.9152	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)

Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.2500 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2125 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2709	0.2656	0.2603	0.2338	0.2284	0.2019	0.2019	0.1966	0.2125	0.2284	0.2391	0.2497	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	80.1000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.3704	0.3651	0.3598	0.3332	0.3279	0.3014	0.3014	0.2961	0.3120	0.3279	0.3386	0.3492	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Door			4.1400	1.0000	4.1400			(26)
Window			12.4100	0.7752	9.6202			(27)
GF			47.0600	0.0900	4.2354	75.0000	3529.5000	(28a)
Exposed Floor			2.7200	0.1400	0.3808	20.0000	54.4000	(28b)
Main	136.0800	16.5500	119.5300	0.1300	15.5389	9.0000	1075.7700	(29a)
Dwarf Wall (PIRx0.72)	16.7700		16.7700	0.0900	1.5093	9.0000	150.9300	(29a)
PIJ	15.5100		15.5100	0.1300	2.0163	9.0000	139.5900	(30)
PIR	12.2300		12.2300	0.1300	1.5899	9.0000	110.0700	(30)
Residual Ceiling	26.3800		26.3800	0.0900	2.3742	9.0000	237.4200	(30)
Total net area of external elements Aum(A, m2)			256.7500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		41.4050			(33)
Main dwelling								
Party Wall 1			40.6300	0.0000	0.0000	20.0000	812.6000	(32)
Timber			124.1700			9.0000	1117.5300	(32c)
FF			47.0600			18.0000	847.0800	(32d)
SF			23.4000			18.0000	421.2000	(32d)
GF			47.0600			9.0000	423.5400	(32e)
FF			23.4000			9.0000	210.6000	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 9130.2300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	75.9334 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	11.3700	0.1150	1.3075
E3 Sill	11.3700	0.0170	0.1933
E4 Jamb	39.6000	0.0940	3.7224
E5 Ground floor (normal)	22.8600	0.0670	1.5316
E11 Eaves (insulation at rafter level)	18.1000	0.0250	0.4525
E16 Corner (normal)	29.0400	0.0680	1.9747
E12 Gable (insulation at ceiling level)	5.6600	0.0770	0.4358
E6 Intermediate floor within a dwelling	39.5500	0.0320	1.2656
E17 Corner (inverted - internal area greater than external area)	2.4800	-0.0290	-0.0719
P1 Party wall - Ground floor	6.2400	0.3200	1.9968
E20 Exposed floor (normal)	3.3800	0.0790	0.2670
E21 Exposed floor (inverted)	3.3800	0.0630	0.2129
E13 Gable (insulation at rafter level)	8.2800	0.0740	0.6127
E18 Party wall between dwellings	5.5600	0.0920	0.5115
R6 Flat ceiling	18.1000	-0.0430	-0.7783
E25 Staggered party wall between dwellings	4.9600	0.0560	0.2778

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	13.9120 (36)
Point Thermal bridges	(36a) = 0.0000
Total fabric heat loss	(33) + (36) + (36a) = 55.3170 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	39.1078	38.5470	37.9861	35.1819	34.6210	31.8168	31.8168	31.2559	32.9385	34.6210	35.7427	36.8644	(38)
Heat transfer coeff	94.4248	93.8640	93.3031	90.4989	89.9380	87.1338	87.1338	86.5729	88.2555	89.9380	91.0597	92.1814	(39)

Average = Sum(39)m / 12 = 90.3587

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7853	0.7806	0.7760	0.7527	0.7480	0.7247	0.7247	0.7200	0.7340	0.7480	0.7573	0.7666	(40)
HLP (average)												0.7515	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.8642 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
72.2437	71.1580	69.5759	66.5490	64.3151	61.8240	60.4080	61.9781	63.6992	66.3739	69.4659	71.9669	(42a)

Hot water usage for baths

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
31.1904	30.7271	30.0748	28.8721	27.9715	26.9729	26.4334	27.0812	27.7865	28.8550	30.0826	31.0849	(42b)

Hot water usage for other uses

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
43.9627	42.3640	40.7654	39.1667	37.5681	35.9694	35.9694	37.5681	39.1667	40.7654	42.3640	43.9627	(42c)

Average daily hot water use (litres/day)	135.4907 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use												

	147.3967	144.2491	140.4161	134.5878	129.8547	124.7663	122.8109	126.6274	130.6524	135.9943	141.9125	147.0144	(44)
Energy conte	233.4403	205.4088	215.8143	184.2439	174.8094	153.4147	148.5292	156.7911	161.1075	184.5430	202.1803	230.1891	(45)
Energy content (annual)											Total = Sum(45)m =	2250.4717	
Distribution loss (46)m = 0.15 x (45)m													
	35.0160	30.8113	32.3722	27.6366	26.2214	23.0122	22.2794	23.5187	24.1661	27.6815	30.3271	34.5284	(46)
Water storage loss:													
Store volume												210.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5800	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8532	(55)
Total storage loss													
	26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(56)
If cylinder contains dedicated solar storage													
	17.0031	15.3576	17.0031	16.4546	17.0031	16.4546	17.0031	17.0031	16.4546	17.0031	16.4546	17.0031	(57)
Primary loss	23.2624	21.0112	21.8667	15.7584	10.4681	9.9053	10.2355	11.1660	17.1091	21.8667	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	273.7058	241.7776	254.6841	216.4569	202.2805	179.7746	175.7677	184.9602	194.6712	223.4127	241.1469	270.4545	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Aperture area of solar collector												3.0000	(H1)
Zero-loss collector efficiency												0.8000	(H2)
Collector linear heat loss coefficient												1.8000	(H3)
Collector 2nd order heat loss coefficient												0.0000	(H4)
Collector loop efficiency												0.9000	(H5)
Incidence angle modifier												1.0000	(H6)
Overshading factor												0.8000	(H8)
Overall heat loss coefficient of system												6.5000	(H10)
Heat loss coefficient of collector loop												3.9667	(H11)
Dedicated solar storage volume												75.0000	(H12)
If combined cylinder, total volume of cylinder												210.0000	(H13)
Effective solar volume												115.5000	(H14)
Reference volume												225.0000	(H15)
Storage tank correction coefficient												1.1814	(H16)
Heat delivered to hot water												661.7243	(H24)
Heat delivered to space heating												0.0000	(H29)
Solar input												661.7243	
Solar input	-0.0000	-20.2144	-62.8139	-84.6635	-109.0628	-100.4582	-99.7212	-87.9174	-62.1691	-33.3828	-1.3210	-0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	273.7058	221.5632	191.8702	131.7934	93.2177	79.3164	76.0465	97.0428	132.5020	190.0299	239.8259	270.4545	(64)
											Total per year (kWh/year) = Sum(64)m =	1997.3683	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
											Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	0.0000	(64a)
Heat gains from water heating, kWh/month													
	109.8313	97.3935	102.8540	87.0315	80.1010	72.0983	71.1768	74.6683	80.4192	92.4563	98.3982	108.7502	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	40.8766	36.3063	29.5262	22.3533	16.7093	14.1067	15.2428	19.8132	26.5932	33.7662	39.4101	42.0127	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	426.1571	430.5793	419.4356	395.7119	365.7649	337.6190	318.8159	314.3937	325.5374	349.2611	379.2081	407.3540	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	(71)
Water heating gains (Table 5)													
	147.6227	144.9308	138.2447	120.8771	107.6627	100.1365	95.6677	100.3606	111.6933	124.2693	136.6642	146.1697	(72)
Total internal gains													
	726.9908	724.1507	699.5409	651.2766	602.4713	564.1966	542.0607	546.9018	576.1583	619.6310	667.6168	707.8707	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	3.8000	10.6334	0.3000	0.0000	0.7700	9.3340	(74)
East	5.8000	19.6403	0.3000	0.0000	0.7700	26.3140	(76)
West	2.8100	19.6403	0.3000	0.0000	0.7700	12.7487	(80)

Solar gains	48.3967	94.2527	156.1552	232.2235	290.5167	300.4683	284.7653	240.3082	182.8057	111.9063	60.2213	39.9046	(83)
Total gains	775.3875	818.4034	855.6961	883.5001	892.9880	864.6649	826.8260	787.2100	758.9640	731.5372	727.8381	747.7753	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	26.8592	27.0197	27.1821	28.0244	28.1991	29.1067	29.1067	29.2952	28.7367	28.1991	27.8518	27.5129	
alpha	2.7906	2.8013	2.8121	2.8683	2.8799	2.9404	2.9404	2.9530	2.9158	2.8799	2.8568	2.8342	
util living area													
	0.9248	0.9089	0.8772	0.8150	0.7175	0.5683	0.4364	0.4700	0.6579	0.8253	0.9008	0.9300	(86)
Living	18.9993	19.2105	19.5924	20.1137	20.5364	20.8412	20.9460	20.9323	20.7386	20.2145	19.5612	18.9970	
Non living	18.4133	18.6234	19.0001	19.5189	19.9194	20.2062	20.2883	20.2830	20.1157	19.6248	18.9853	18.4226	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	19.9765	19.2105	19.5924	20.1137	20.5364	20.8412	20.9460	20.9323	20.7386	20.2145	19.5612	19.2772	(87)
Th 2	20.2661	20.2701	20.2742	20.2946	20.2986	20.3191	20.3191	20.3232	20.3109	20.2986	20.2905	20.2823	(88)
util rest of house													
	0.9174	0.9000	0.8649	0.7957	0.6868	0.5218	0.3764	0.4102	0.6144	0.8035	0.8898	0.9232	(89)
MIT 2	19.3183	18.6234	19.0001	19.5189	19.9194	20.2062	20.2883	20.2830	20.1157	19.6248	18.9853	18.6828	(90)
Living area fraction											fLA = Living area / (4) =	0.2917	(91)

MIT	19.5103	18.7947	19.1729	19.6925	20.0994	20.3914	20.4802	20.4724	20.2974	19.7968	19.1533	18.8562	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5103	18.7947	19.1729	19.6925	20.0994	20.3914	20.4802	20.4724	20.2974	19.7968	19.1533	18.8562	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9088	0.8783	0.8429	0.7774	0.6774	0.5269	0.3909	0.4238	0.6135	0.7859	0.8689	0.9068	(94)
Useful gains	704.6782	718.8345	721.2995	686.8555	604.8855	455.6297	323.2440	333.6102	465.6206	574.9463	632.4422	678.1156	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1436.2333	1304.2114	1182.4257	976.7053	755.4283	504.6283	338.0926	352.5616	546.9573	827.1444	1097.5736	1351.0265	(97)
Space heating kWh													
	544.2770	393.3733	343.0779	208.6919	112.0038	0.0000	0.0000	0.0000	0.0000	187.6354	334.8946	500.6457	(98a)
Space heating requirement - total per year (kWh/year)												2624.5996	
Solar heating kWh													
	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	544.2770	393.3733	343.0779	208.6919	112.0038	0.0000	0.0000	0.0000	0.0000	187.6354	334.8946	500.6457	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2624.5996	
Space heating per m2											(98c) / (4) =	21.8280	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												282.0592	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	544.2770	393.3733	343.0779	208.6919	112.0038	0.0000	0.0000	0.0000	0.0000	187.6354	334.8946	500.6457	(98)
Space heating efficiency (main heating system 1)													
	282.0592	282.0592	282.0592	282.0592	282.0592	0.0000	0.0000	0.0000	0.0000	282.0592	282.0592	282.0592	(210)
Space heating fuel (main heating system)													
	192.9655	139.4648	121.6333	73.9887	39.7093	0.0000	0.0000	0.0000	0.0000	66.5234	118.7320	177.4967	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	273.7058	221.5632	191.8702	131.7934	93.2177	79.3164	76.0465	97.0428	132.5020	190.0299	239.8259	270.4545	(64)
Efficiency of water heater												279.7045	(216)
(217)m	279.7045	279.7045	279.7045	279.7045	279.7045	279.7045	279.7045	279.7045	279.7045	279.7045	279.7045	279.7045	(217)
Fuel for water heating, kWh/month													
	97.8553	79.2133	68.5975	47.1188	33.3272	28.3572	27.1882	34.6947	47.3722	67.9395	85.7426	96.6930	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	51.8101	46.7963	51.8101	50.1389	51.8101	50.1389	51.8101	51.8101	50.1389	51.8101	50.1389	51.8101	(231)
Lighting	35.7791	28.7033	25.8441	18.9345	14.6256	11.9492	13.3419	17.3423	22.5260	29.5553	33.3827	36.7735	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-38.4567	-57.4398	-86.9350	-101.3686	-110.7368	-101.0164	-99.8337	-93.0284	-80.9065	-66.8037	-43.1013	-32.7566	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-11.6298	-26.1402	-55.4113	-89.4035	-124.9459	-130.6973	-128.8179	-106.7456	-75.5566	-40.0422	-16.3085	-9.1572	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	930.5139	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	279.7045	
Water heating fuel used	714.0995	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.3580)		
mechanical ventilation fans (SFP = 1.3580)	530.0227	(230a)
pump for solar water heating	80.0000	(230g)
Total electricity for the above, kWh/year	610.0227	(231)
Electricity for lighting (calculated in Appendix L)	288.7576	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1727.2394	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	816.1543	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	930.5139	16.4900	153.4417	(240)

Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	714.0995	16.4900	117.7550	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	530.0227	16.4900	87.4007	(249)
Pump for solar water heating	80.0000	16.4900	13.1920	(249)
Energy for lighting	288.7576	16.4900	47.6161	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-912.3834	16.4900	-150.4520	
PV Unit electricity exported	-814.8559	5.5900	-45.5504	
Total			-196.0025	(252)
Total energy cost			223.4031	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.4867	(257)
SAP value		92.1103	
SAP rating (Section 12)		92	(258)
SAP band		A	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	930.5139	0.1549	144.1074	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	714.0995	0.1460	104.2910	(264)
Space and water heating			248.3983	(265)
Pumps, fans and electric keep-hot	610.0227	0.1387	84.6177	(267)
Energy for lighting	288.7576	0.1443	41.6766	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-912.3834	0.1340	-122.2990	
PV Unit electricity exported	-814.8559	0.1237	-100.7695	
Total			-223.0685	(269)
Total CO2, kg/year			151.6241	(272)
CO2 emissions per m2			1.2600	(273)
EI value			98.7704	
EI rating			99	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.0600	(1b) x	2.4800	(2b) =	116.7088	(1b) - (3b)
First floor	49.7800	(1c) x	2.7800	(2c) =	138.3884	(1c) - (3c)
Second floor	23.4000	(1d) x	2.7700	(2d) =	64.8180	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	120.2400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		319.9152	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.2500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2125	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.6000	4.5000	4.5000	4.1000	4.2000	3.7000	3.5000	3.5000	3.7000	4.1000	4.1000	4.2000	(22)
Wind factor	1.1500	1.1250	1.1250	1.0250	1.0500	0.9250	0.8750	0.8750	0.9250	1.0250	1.0250	1.0500	(22a)
Adj infilt rate	0.2444	0.2391	0.2391	0.2178	0.2231	0.1966	0.1859	0.1859	0.1966	0.2178	0.2178	0.2231	(22b)

Balanced mechanical ventilation with heat recovery		
If mechanical ventilation		0.5000	(23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 80.1000 (23c)

Effective ac	0.3439	0.3386	0.3386	0.3173	0.3226	0.2961	0.2854	0.2854	0.2961	0.3173	0.3173	0.3226	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Door			4.1400	1.0000	4.1400			(26)
Window			12.4100	0.7752	9.6202			(27)
GF			47.0600	0.0900	4.2354	75.0000	3529.5000	(28a)
Exposed Floor			2.7200	0.1400	0.3808	20.0000	54.4000	(28b)
Main	136.0800	16.5500	119.5300	0.1300	15.5389	9.0000	1075.7700	(29a)
Dwarf Wall (PIRx0.72)	16.7700		16.7700	0.0900	1.5093	9.0000	150.9300	(29a)
PIJ	15.5100		15.5100	0.1300	2.0163	9.0000	139.5900	(30)
PIR	12.2300		12.2300	0.1300	1.5899	9.0000	110.0700	(30)
Residual Ceiling	26.3800		26.3800	0.0900	2.3742	9.0000	237.4200	(30)
Total net area of external elements Aum(A, m2)			256.7500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		41.4050			(33)
Main dwelling								
Party Wall 1			40.6300	0.0000	0.0000	20.0000	812.6000	(32)
Timber			124.1700			9.0000	1117.5300	(32c)
FF			47.0600			18.0000	847.0800	(32d)
SF			23.4000			18.0000	421.2000	(32d)
GF			47.0600			9.0000	423.5400	(32e)
FF			23.4000			9.0000	210.6000	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 9130.2300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 75.9334 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	11.3700	0.1150	1.3075
E3 Sill	11.3700	0.0170	0.1933
E4 Jamb	39.6000	0.0940	3.7224
E5 Ground floor (normal)	22.8600	0.0670	1.5316
E11 Eaves (insulation at rafter level)	18.1000	0.0250	0.4525
E16 Corner (normal)	29.0400	0.0680	1.9747
E12 Gable (insulation at ceiling level)	5.6600	0.0770	0.4358
E6 Intermediate floor within a dwelling	39.5500	0.0320	1.2656
E17 Corner (inverted - internal area greater than external area)	2.4800	-0.0290	-0.0719
P1 Party wall - Ground floor	6.2400	0.3200	1.9968
E20 Exposed floor (normal)	3.3800	0.0790	0.2670
E21 Exposed floor (inverted)	3.3800	0.0630	0.2129
E13 Gable (insulation at rafter level)	8.2800	0.0740	0.6127
E18 Party wall between dwellings	5.5600	0.0920	0.5115
R6 Flat ceiling	18.1000	-0.0430	-0.7783
E25 Staggered party wall between dwellings	4.9600	0.0560	0.2778

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 13.9120 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 55.3170 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	36.3036	35.7427	35.7427	33.4993	34.0602	31.2559	30.1342	30.1342	31.2559	33.4993	33.4993	34.0602	(38)
Heat transfer coeff	91.6206	91.0597	91.0597	88.8163	89.3772	86.5729	85.4512	85.4512	86.5729	88.8163	88.8163	89.3772	(39)

Average = Sum(39)m / 12 = 88.5826

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7620	0.7573	0.7573	0.7387	0.7433	0.7200	0.7107	0.7107	0.7200	0.7387	0.7387	0.7433	(40)
HLP (average)												0.7367	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.8642 (42)
Hot water usage for mixer showers

72.2437	71.1580	69.5759	66.5490	64.3151	61.8240	60.4080	61.9781	63.6992	66.3739	69.4659	71.9669	(42a)

Hot water usage for baths

31.1904	30.7271	30.0748	28.8721	27.9715	26.9729	26.4334	27.0812	27.7865	28.8550	30.0826	31.0849	(42b)

Hot water usage for other uses

43.9627	42.3640	40.7654	39.1667	37.5681	35.9694	35.9694	37.5681	39.1667	40.7654	42.3640	43.9627	(42c)

Average daily hot water use (litres/day) 135.4907 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	147.3967	144.2491	140.4161	134.5878	129.8547	124.7663	122.8109	126.6274	130.6524	135.9943	141.9125	147.0144	(44)
Energy conte	233.4403	205.4088	215.8143	184.2439	174.8094	153.4147	148.5292	156.7911	161.1075	184.5430	202.1803	230.1891	(45)
Energy content (annual)										Total = Sum(45)m =		2250.4717	
Distribution loss (46)m = 0.15 x (45)m	35.0160	30.8113	32.3722	27.6366	26.2214	23.0122	22.2794	23.5187	24.1661	27.6815	30.3271	34.5284	(46)
Water storage loss:													
Store volume												210.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5800	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8532	(55)
Total storage loss	26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(56)
If cylinder contains dedicated solar storage	17.0031	15.3576	17.0031	16.4546	17.0031	16.4546	17.0031	17.0031	16.4546	17.0031	16.4546	17.0031	(57)
Primary loss	23.2624	21.0112	21.8667	15.7584	10.4681	9.9053	10.2355	11.1660	17.1091	21.8667	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	273.7058	241.7776	254.6841	216.4569	202.2805	179.7746	175.7677	184.9602	194.6712	223.4127	241.1469	270.4545	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)

Aperture area of solar collector 3.0000 (H1)
Zero-loss collector efficiency 0.8000 (H2)
Collector linear heat loss coefficient 1.8000 (H3)
Collector 2nd order heat loss coefficient 0.0000 (H4)
Collector loop efficiency 0.9000 (H5)
Incidence angle modifier 1.0000 (H6)
Overshading factor 0.8000 (H8)

Overall heat loss coefficient of system												6.5000	(H10)
Heat loss coefficient of collector loop												3.9667	(H11)
Dedicated solar storage volume												75.0000	(H12)
If combined cylinder, total volume of cylinder												210.0000	(H13)
Effective solar volume												115.5000	(H14)
Reference volume												225.0000	(H15)
Storage tank correction coefficient												1.1814	(H16)
Heat delivered to hot water												605.2985	(H24)
Heat delivered to space heating												0.0000	(H29)
Solar input												605.2985	
Solar input	-0.0000	-14.4753	-57.1346	-80.0537	-101.5431	-95.3649	-92.1367	-79.1730	-57.3788	-28.0385	-0.0000	-0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	273.7058	227.3023	197.5495	136.4032	100.7374	84.4097	83.6309	105.7872	137.2924	195.3743	241.1469	270.4545	(64)
											Total per year (kWh/year) = Sum(64)m =	2053.7941	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
											Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	0.0000	(64a)
Heat gains from water heating, kWh/month													
	109.8313	97.3935	102.8540	87.0315	80.1010	72.0983	71.1768	74.6683	80.4192	92.4563	98.3982	108.7502	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	40.8766	36.3063	29.5262	22.3533	16.7093	14.1067	15.2428	19.8132	26.5932	33.7662	39.4101	42.0127	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	426.1571	430.5793	419.4356	395.7119	365.7649	337.6190	318.8159	314.3937	325.5374	349.2611	379.2081	407.3540	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	(71)
Water heating gains (Table 5)													
	147.6227	144.9308	138.2447	120.8771	107.6627	100.1365	95.6677	100.3606	111.6933	124.2693	136.6642	146.1697	(72)
Total internal gains													
	726.9908	724.1507	699.5409	651.2766	602.4713	564.1966	542.0607	546.9018	576.1583	619.6310	667.6168	707.8707	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	3.8000	8.9975	0.3000	0.0000	0.7700	7.8980	(74)
East	5.8000	16.6187	0.3000	0.0000	0.7700	22.2657	(76)
West	2.8100	16.6187	0.3000	0.0000	0.7700	10.7874	(80)

Solar gains	40.9511	83.7802	146.3955	221.3864	270.8463	285.4449	265.1782	220.4100	173.2680	103.4285	52.9217	36.1041	(83)
Total gains	767.9419	807.9309	845.9364	872.6630	873.3176	849.6415	807.2390	767.3119	749.4263	723.0595	720.5385	743.9748	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	27.6813	27.8518	27.8518	28.5553	28.3761	29.2952	29.6798	29.6798	29.2952	28.5553	28.5553	28.3761	
alpha	2.8454	2.8568	2.8568	2.9037	2.8917	2.9530	2.9787	2.9787	2.9530	2.9037	2.9037	2.8917	
util living area													
	0.9206	0.9042	0.8739	0.8047	0.6985	0.5465	0.4389	0.4670	0.6572	0.8208	0.8946	0.9254	(86)
Living	19.1496	19.3514	19.6727	20.1984	20.6021	20.8677	20.9477	20.9368	20.7483	20.2565	19.6807	19.1544	
Non living	18.5758	18.7764	19.0903	19.6095	19.9833	20.2319	20.3014	20.2943	20.1349	19.6712	19.1140	18.5923	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.0534	19.3514	19.6727	20.1984	20.6021	20.8677	20.9477	20.9368	20.7483	20.2565	19.6807	19.4126	(87)
Th 2	20.2864	20.2905	20.2905	20.3068	20.3027	20.3232	20.3314	20.3314	20.3232	20.3068	20.3068	20.3027	(88)
util rest of house													
	0.9129	0.8949	0.8613	0.7844	0.6650	0.4977	0.3796	0.4067	0.6143	0.7984	0.8829	0.9181	(89)
MIT 2	19.4113	18.7764	19.0903	19.6095	19.9833	20.2319	20.3014	20.2943	20.1349	19.6712	19.1140	18.8315	(90)
Living area fraction											fLA = Living area / (4) =	0.2917	(91)
MIT	19.5987	18.9442	19.2602	19.7813	20.1639	20.4174	20.4900	20.4818	20.3139	19.8420	19.2793	19.0011	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5987	18.9442	19.2602	19.7813	20.1639	20.4174	20.4900	20.4818	20.3139	19.8420	19.2793	19.0011	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9044	0.8737	0.8400	0.7673	0.6578	0.5047	0.3940	0.4206	0.6136	0.7815	0.8625	0.9019	(94)
Useful gains	694.5305	705.8896	710.5904	669.6339	574.5089	428.8242	318.0704	322.7603	459.8685	565.0489	621.4856	670.9966	(95)
Ext temp.	4.7000	5.3000	6.7000	9.3000	12.3000	15.0000	16.6000	16.5000	14.1000	10.8000	7.5000	4.6000	(96)
Heat loss rate W													
	1365.0233	1242.4342	1143.7265	930.9072	702.8492	469.0003	332.4034	340.2492	537.9518	803.0760	1046.1977	1287.1259	(97)
Space heating kWh													
	498.8467	360.5579	322.2532	188.1168	95.4852	0.0000	0.0000	0.0000	0.0000	177.0921	305.7927	458.4002	(98a)
Space heating requirement - total per year (kWh/year)												2406.5448	
Solar heating kWh													
	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	498.8467	360.5579	322.2532	188.1168	95.4852	0.0000	0.0000	0.0000	0.0000	177.0921	305.7927	458.4002	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2406.5448	
Space heating per m2											(98c) / (4) =	20.0145	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												281.2207	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	498.8467	360.5579	322.2532	188.1168	95.4852	0.0000	0.0000	0.0000	0.0000	177.0921	305.7927	458.4002	(98)
Space heating efficiency (main heating system 1)													
	281.2207	281.2207	281.2207	281.2207	281.2207	0.0000	0.0000	0.0000	0.0000	281.2207	281.2207	281.2207	(210)
Space heating fuel (main heating system)													
	177.3862	128.2117	114.5909	66.8929	33.9538	0.0000	0.0000	0.0000	0.0000	62.9727	108.7376	163.0037	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	273.7058	227.3023	197.5495	136.4032	100.7374	84.4097	83.6309	105.7872	137.2924	195.3743	241.1469	270.4545	(64)
Efficiency of water heater												279.7126	(216)
(217)m	279.7126	279.7126	279.7126	279.7126	279.7126	279.7126	279.7126	279.7126	279.7126	279.7126	279.7126	279.7126	(217)
Fuel for water heating, kWh/month													
	97.8525	81.2628	70.6259	48.7655	36.0146	30.1773	29.8989	37.8200	49.0834	69.8482	86.2124	96.6902	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	51.8101	46.7963	51.8101	50.1389	51.8101	50.1389	51.8101	51.8101	50.1389	51.8101	50.1389	51.8101	(231)
Lighting	35.7791	28.7033	25.8441	18.9345	14.6256	11.9492	13.3419	17.3423	22.5260	29.5553	33.3827	36.7735	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-33.1601	-52.0426	-82.6457	-97.7793	-105.7373	-98.2583	-96.0663	-88.4777	-78.1809	-62.8493	-38.5629	-29.9262	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-9.2208	-22.2507	-50.8039	-84.0901	-113.9878	-121.8697	-116.8579	-94.7545	-70.1189	-35.9022	-13.6458	-7.9958	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												855.7496	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												279.7126	
Water heating fuel used												734.2516	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.3580)													
mechanical ventilation fans (SFP = 1.3580)												530.0227	(230a)
pump for solar water heating												80.0000	(230g)
Total electricity for the above, kWh/year												610.0227	(231)
Electricity for lighting (calculated in Appendix L)												288.7576	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1605.1846	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												883.5969	(238)

10a. Fuel costs - using BEDF prices (583)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	855.7496	28.4300	243.2896	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	734.2516	28.4300	208.7477	(247)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(247a)
Pumps, fans and electric keep-hot	530.0227	28.4300	150.6855	(249)
Pump for solar water heating	80.0000	28.4300	22.7440	(249)
Energy for lighting	288.7576	28.4300	82.0938	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-863.6865	28.4300	-245.5461	
PV Unit electricity exported	-741.4981	5.8100	-43.0810	
Total			-288.6271	(252)
Total energy cost			418.9335	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	855.7496	0.1549	132.5611	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	734.2516	0.1456	106.9271	(264)
Space and water heating			239.4882	(265)
Pumps, fans and electric keep-hot	610.0227	0.1387	84.6177	(267)

Energy for lighting	288.7576	0.1443	41.6766	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-863.6865	0.1337	-115.4669	
PV Unit electricity exported	-741.4981	0.1234	-91.5260	
Total			-206.9928	(269)
Total CO2, kg/year			158.7897	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	855.7496	1.5735	1346.5101	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	734.2516	1.5387	1129.7837	(278)
Space and water heating			2476.2938	(279)
Pumps, fans and electric keep-hot	610.0227	1.5128	922.8423	(281)
Energy for lighting	288.7576	1.5338	442.9060	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-863.6865	1.4941	-1290.4031	
PV Unit electricity exported	-741.4981	0.4530	-335.9016	
Total			-1626.3047	(283)
Total Primary energy kWh/year			2215.7374	(286)

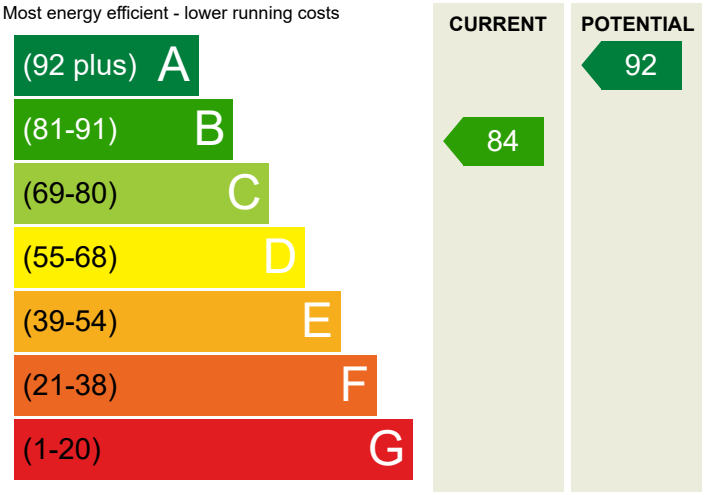
Energy Report

Dwelling Address	838 Rochdale Road, MANCHESTER, M9 8FA
Reference	78449-09-001
Assessment Date	02/07/2025
Submission Date	
Property Type	House, End-Terrace
Total Floor Area	120

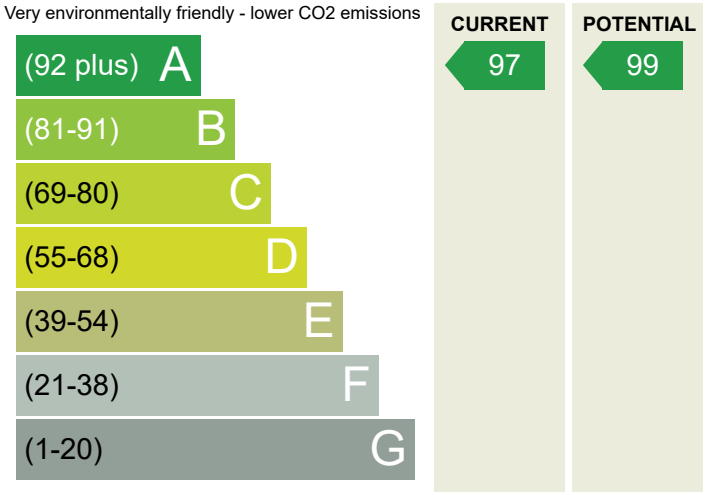
This Energy Report has been generated using the UK's National Calculation Methodology for dwellings, Standard Assessment Procedure (SAP). This methodology is used to assess the energy efficiency of dwellings which is calculated based on a dwelling's heating, hot water, ventilation and lighting usage.

This document is not an Energy Performance Certificate (EPC) as required by the Energy Performance of Buildings Regulations

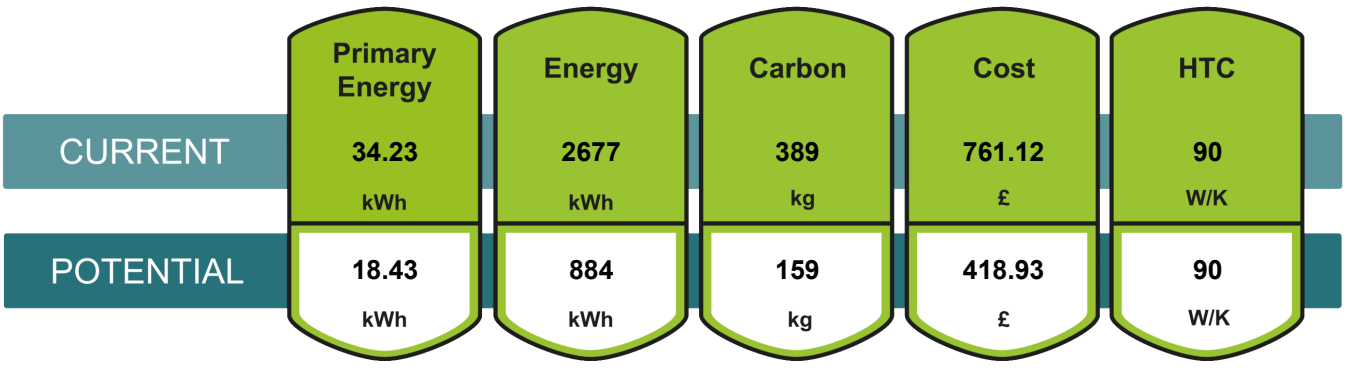
Energy Efficiency Rating



Carbon Dioxide (CO2) Emissions Rating



Additional ratings for your home



Energy Report

Breakdown of property's energy performance

Each feature is assessed as one of the following:

Very Poor | Poor | Average | Good | Very Good

Feature	Description	Energy Performance
Walls	Average thermal transmittance 0.13 W/m²K	Very Good
Roof	Average thermal transmittance 0.11 W/m²K	Very Good
Floor	Average thermal transmittance 0.09 W/m²K	Very Good
Windows	High performance glazing	Very Good
Main heating	Air source heat pump, radiators, electric	Good
Main heating controls	Programmer, room thermostat and TRVs	Good
Secondary heating	None	
Hot water	From main system	Good
Lighting	Good lighting efficiency	Good
Air tightness	Air permeability [AP50] = 5.0 m³/h.m² (as tested)	Good

Recommendations

The recommended measures provided below will help to improve the energy efficiency of the dwelling.
To reach the dwelling's potential energy rating all of the recommended measures shown below would need to be installed.
Having these measures installed individually or in any other order may give a different result when compared with the cumulative potential rating.

Recommended measures	Cumulative savings (per year)	Cumulative rating	Typical costs	Incremental savings (per year)	Cumulative CO2 rating
Solar water heating	£54	B 85	£4,000 - £7,000	£54	A 97
Photovoltaic	£342	A 92	£8,000 - £10,000	£289	A 99

Energy Report

The typical cost is based on average installation prices across the country so may not be representative of the actual costs in your area.

Estimated energy costs of the dwelling

The table below shows the estimated running costs of the space and water heating and lighting within the dwelling. It does not include the energy used from household appliances. The estimated annual costs after potential improvements indicates the total energy cost if all recommended measures named above were installed.

	Estimated annual costs	Estimated annual costs after potential improvements	Potential future savings
Lighting	£82	£82	
Heating	£391	£417	
Hot Water	£288	£209	
New Technologies e.g. Impact of PV	£0	-(£289)	
TOTAL	£761	£419	

Estimated energy use and potential savings

Space Heating
845
kWh per year

Water Heating
1014
kWh per year

Energy Report

About this document

Created by:	
Company/Trading name:	
Phone number:	
Email address:	

Disclaimer

This Energy Report should not under any circumstances be treated as a Condition Survey and cannot be used to indicate that any element of the dwelling (e.g.heating system) is working correctly.
This Energy Report must not be used in situations where an Energy Performance Certificate (EPC) is required.
This Energy Report is generated from a set of data inputs which may not reflect the actual dimensions, services or construction of the dwelling.
The calculation used to generate this report reflects the SAP Methodology current at the time of report generation.

Glossary terms for additional metrics

Primary Energy	The measure of the energy required for lighting, heating and hot water in a property. This includes the efficiency of the property's heating system, power station efficiency for electricity and the energy used to produce the fuel and deliver it to the property.
Energy Used	The estimated amount of fuel energy for lighting, heating and hot water for the property. The estimate is based on typical usage which is likely to be different to actual consumption.
Carbon (CO2)	The current emissions based on the energy estimates.
Cost	The estimated cost of energy. The cost of each unit of fuel is based on an industry standard which is likely to be different to those the occupier actually pays.
Heat Transfer Coefficient	Heat flow through the property envelope where internal and external temperatures are different.

Building Regulations England Part L (BREL) Compliance Report

Approved Document L1 2021 Edition, England assessed by Array SAP 10 program, Array

Date: Fri 03 Oct 2025 15:03:27

Project Information			
Assessed By	Paul Goddard	Building Type	House, Mid-terrace
OCDEA Registration	EES/005113	Assessment Date	2025-10-03

Dwelling Details			
Assessment Type	As built	Total Floor Area	91 m^2
Site Reference	78449-10	Plot Reference	001
Address	836 Rochdale Road, MANCHESTER, M9 8FA		

Client Details	
Name	-
Company	John Southworth
Address	Unit 10, Charles Street, DUKINFIELD, SK16 4SD

This report covers items included within the SAP calculations. It is not a complete report of regulations compliance.

1a Target emission rate and dwelling emission rate		
Fuel for main heating system	Electricity	
Target carbon dioxide emission rate	*11.59 $kgCO_2/m^2$*	
Dwelling carbon dioxide emission rate	3.63 $kgCO_2/m^2$	**OK**
1b Target primary energy rate and dwelling primary energy		
Target primary energy	*60.76 kWh_{PE}/m^2*	
Dwelling primary energy	38.42 kWh_{PE}/m^2	**OK**
1c Target fabric energy efficiency and dwelling fabric energy efficiency		
Target fabric energy efficiency	*37.6 kWh/m^2*	
Dwelling fabric energy efficiency	34.2 kWh/m^2	**OK**

2a Fabric U-values				
Element	***Maximum permitted average U-Value [W/m^2K]***	**Dwelling average U-Value [W/m^2K]**	**Element with highest individual U-Value**	
External walls	*0.26*	0.13	Walls (1) (0.13)	**OK**
Party walls	*0.2*	0	Party Wall (1) (0)	**N/A**
Curtain walls	*1.6*	0	N/A	**N/A**
Floors	*0.18*	0.1	Exposed Floor (0.14)	**OK**
Roofs	*0.16*	0.13	Roof (1) (0.13)	**OK**
Windows, doors, and roof windows	*1.6*	0.87	Front (1)	**OK**
Rooflights	*2.2*	N/A	N/A	**N/A**

2b Envelope elements (better than typically expected values are flagged with a subsequent (!))		
Name	**Net area [m^2]**	**U-Value [W/m^2K]**
Exposed wall: Walls (1)	59.2	0.13 **(!)**
Party wall: Party Wall (1)	81.22	0 **(!)**
Ground floor: GF, GF	41.18	0.09 **(!)**
Upper floor: Exposed Floor, Exposed Floor	8.6	0.14
Exposed roof: Roof (1)	49.779998779296875	0.13

2c Openings (better than typically expected values are flagged with a subsequent (!))				
Name	**Area [m^2]**	**Orientation**	**Frame factor**	**U-Value [W/m^2K]**
Front, Door	1.99	East	N/A	1 **(!)**
Front, Window	4.98	East	1.0	0.8 **(!)**
Rear, Window	3.53	West	1.0	0.8 **(!)**
Rear, Door	2.15	West	N/A	1 **(!)**

2d Thermal bridging (better than typically expected values are flagged with a subsequent (!))				
Building part **1**: Thermal bridging calculated from linear thermal transmittances for each junction				
Main element	**Junction detail**	**Source**	**Psi value [W/mK]**	**Drawing / reference**
External wall	E2: Other lintels (including other steel lintels)	Calculated by person with suitable expertise	0.115	Thermal Bridge Report

Main element	Junction detail	Source	Psi value [W/mK]	Drawing / reference
External wall	E3: Sill	Calculated by person with suitable expertise	0.017 **(!)**	Thermal Bridge Report
External wall	E4: Jamb	Calculated by person with suitable expertise	0.094	Thermal Bridge Report
External wall	E5: Ground floor (normal)	Calculated by person with suitable expertise	0.067	Thermal Bridge Report
External wall	E16: Corner (normal)	Calculated by person with suitable expertise	0.068	Thermal Bridge Report
External wall	E12: Gable (insulation at ceiling level)	Calculated by person with suitable expertise	0.077	Thermal Bridge Report
External wall	E6: Intermediate floor within a dwelling	Calculated by person with suitable expertise	0.032 **(!)**	Thermal Bridge Report
External wall	E17: Corner (inverted - internal area greater than external area)	Calculated by person with suitable expertise	-0.029 **(!)**	Thermal Bridge Report
Party wall	P1: Ground floor	SAP table default	0.32	K1
External wall	E20: Exposed floor (normal)	Calculated by person with suitable expertise	0.079	Thermal Bridge Report
External wall	E21: Exposed floor (inverted)	Calculated by person with suitable expertise	0.063	Thermal Bridge Report
External wall	E18: Party wall between dwellings	Calculated by person with suitable expertise	0.092	Thermal Bridge Report
Party wall	P4: Roof (insulation at ceiling level)	Calculated by person with suitable expertise	0.102	Thermal Bridge Report
External wall	E25: Staggered party wall between dwellings	Calculated by person with suitable expertise	0.056	Thermal Bridge Report

3 Air permeability (better than typically expected values are flagged with a subsequent (!))		
Maximum permitted air permeability at 50Pa	*8 m^3/hm^2*	
Dwelling air permeability at 50Pa	5 m^3/hm^2, Measured value	OK
Air permeability test certificate reference		

4 Space heating	
Main heating system 1: Heat pump with radiators or underfloor heating - Electricity	
Efficiency	270.9%
Emitter type	Radiators
Flow temperature	45°C
System type	
Manufacturer	Daikin Europe NV
Model	EDLA09DA3V3
Commissioning	
Secondary heating system: N/A	
Fuel	N/A
Efficiency	N/A
Commissioning	

5 Hot water	
Cylinder/store - type: Cylinder	
Capacity	210 litres
Declared heat loss	1.58 kWh/day
Primary pipework insulated	Yes
Manufacturer	
Model	
Commissioning	
Waste water heat recovery system 1 - type: N/A	
Efficiency	
Manufacturer	
Model	

6 Controls	
Main heating 1 - type: Programmer, room thermostat and TRVs	
Function	
Ecodesign class	
Manufacturer	
Model	

Water heating - type: Cylinder thermostat and HW separately timed	
Manufacturer	
Model	

7 Lighting		
Minimum permitted light source efficacy	*75 lm/W*	
Lowest light source efficacy	80 lm/W	OK
External lights control	N/A	

8 Mechanical ventilation		
System type: Balanced whole-house mechanical ventilation with heat recovery		
Maximum permitted specific fan power	*1.5 W/(l/s)*	
Specific fan power	0.85 W/(l/s)	OK
Minimum permitted heat recovery efficiency	*73%*	
Heat recovery efficiency	90%	OK
Manufacturer/Model	DV110 Adroit	
Commissioning		

9 Local generation
N/A

10 Heat networks
N/A

11 Supporting documentary evidence	
Documentary evidence identified in 11.1 and 11.2 is needed to confirm the data values used for any calculations undertaken, manufacturer declarations made, and tests performed as reflected in this "As built" BREL Compliance Report are correct. 11.1 SAP Conventions, Appendix 1 (documentary evidence) schedules the minimum documentary evidence required. 11.2 Indicative photographic evidence of key stages during construction (guidance within Approved Document L, Volume 1 – Appendix B) that confirms the products identified in this BREL Compliance Report are used in this dwelling, and workmanship is of sufficient quality to support the calculated values claimed in 2a to 2d.	

12 Declarations	
a. Assessor Declaration	
This declaration by the assessor is confirmation that the contents of this BREL Compliance Report are a true and accurate reflection based upon the design and construction information submitted for this dwelling for the purpose of carrying out the assessment, and that the supporting documentary evidence (identified in 11.1 and 11.2) pursuant to Part L of the Building Regulations 2010 (as amended) has been reviewed in the course of preparing this BREL Compliance Report.	
Signed: Name:	Assessor ID: Date:
b. Client Declaration	
This declaration by the client is confirmation that the dwelling has been constructed and completed according to the specifications set out in this BREL Compliance Report, and that photographic evidence of key stages, as described in 11.2, has been provided to the Assessor for this dwelling.	
Signed: Name:	Organisation: Date:

Full SAP Calculation Printout

Property Reference	78449-10	**Issued on Date**	03/10/2025
Assessment Reference	001	**Prop Type Ref**	Mid
Property	836 Rochdale Road, MANCHESTER, M9 8FA		

SAP Rating	84 B	**DER**	3.63	**TER**	11.59
Environmental	97 A	**% DER < TER**			68.68
CO_2 Emissions (t/year)	0.32	**DFEE**	34.22	**TFEE**	37.64
Compliance Check	See BREL	**% DFEE < TFEE**			9.08
% DPER < TPER	36.77	**DPER**	38.42	**TPER**	60.76

Assessor Details	Mr. Daniel Goddard	**Assessor ID**	CP52-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	41.1800 (1b)	x	2.4800 (2b)	=	102.1264	(1b) - (3b)
First floor	49.7800 (1c)	x	2.7800 (2c)	=	138.3884	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	90.9600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	240.5148	(5)

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2. Ventilation rate

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				m3 per hour	
Number of open chimneys			0 * 80 =	0.0000	(6a)
Number of open flues			0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire			0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler			0 * 20 =	0.0000	(6d)
Number of flues attached to other heater			0 * 35 =	0.0000	(6e)
Number of blocked chimneys			0 * 20 =	0.0000	(6f)
Number of intermittent extract fans			0 * 10 =	0.0000	(7a)
Number of passive vents			0 * 10 =	0.0000	(7b)
Number of flueless gas fires			0 * 40 =	0.0000	(7c)
				Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =			0.0000 / (5) =	0.0000	(8)
Pressure test				Yes	
Pressure Test Method				Blower Door	
Measured/design AP50				5.0000	(17)
Infiltration rate				0.2500	(18)
Number of sides sheltered				2	(19)
Shelter factor			(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =	0.2125	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2709	0.2656	0.2603	0.2338	0.2284	0.2019	0.2019	0.1966	0.2125	0.2284	0.2391	0.2497	(22b)

Balanced mechanical ventilation with heat recovery		
If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	81.0000	(23c)

Effective ac	0.3659	0.3606	0.3553	0.3287	0.3234	0.2969	0.2969	0.2916	0.3075	0.3234	0.3341	0.3447	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door			4.1400	1.0000	4.1400			(26)
Window			8.5100	0.7752	6.5969			(27)
GF			41.1800	0.0900	3.7062	75.0000	3088.5000	(28a)
Exposed Floor			8.6000	0.1400	1.2040	20.0000	172.0000	(28b)
Main	71.8472	12.6500	59.1972	0.1300	7.6956	9.0000	532.7748	(29a)
PIJ	49.7800		49.7800	0.1300	6.4714	9.0000	448.0200	(30)
Total net area of external elements Aum(A, m2)			171.4072					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.8141			(33)
Main dwelling								
Party Wall 1			81.2200	0.0000	0.0000	20.0000	1624.4000	(32)
Timber			96.4800			9.0000	868.3200	(32c)
FF			41.1800			18.0000	741.2400	(32d)
GF			41.1800			9.0000	370.6200	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 7845.8748 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 86.2563 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	8.6300	0.1150	0.9925
E3 Sill	8.6300	0.0170	0.1467
E4 Jamb	28.2000	0.0940	2.6508
E5 Ground floor (normal)	16.6400	0.0670	1.1149
E16 Corner (normal)	4.9600	0.0680	0.3373
E12 Gable (insulation at ceiling level)	11.0000	0.0770	0.8470
E6 Intermediate floor within a dwelling	11.0000	0.0320	0.3520
E17 Corner (inverted - internal area greater than external area)	4.9600	-0.0290	-0.1438
P1 Party wall - Ground floor	12.4600	0.3200	3.9872
E20 Exposed floor (normal)	6.4400	0.0790	0.5088
E21 Exposed floor (inverted)	12.0800	0.0630	0.7610
E18 Party wall between dwellings	11.1200	0.0920	1.0230
P4 Party wall - Roof (insulation at ceiling level)	18.1000	0.1020	1.8462
E25 Staggered party wall between dwellings	9.9200	0.0560	0.5555

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 14.9790 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 44.7932 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	29.0444	28.6228	28.2011	26.0928	25.6712	23.5629	23.5629	23.1413	24.4062	25.6712	26.5145	27.3578	(38)

Heat transfer coeff

	73.8376	73.4159	72.9943	70.8860	70.4644	68.3561	68.3561	67.9345	69.1994	70.4644	71.3077	72.1510	(39)

Average = Sum(39)m / 12 = 70.7806

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8118	0.8071	0.8025	0.7793	0.7747	0.7515	0.7515	0.7469	0.7608	0.7747	0.7839	0.7932	(40)
HLP (average)												0.7782	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6386 (42)
Hot water usage for mixer showers

68.4610	67.4321	65.9329	63.0644	60.9476	58.5869	57.2450	58.7329	60.3639	62.8986	65.8287	68.1987	(42a)

Hot water usage for baths

29.5637	29.1246	28.5063	27.3663	26.5127	25.5661	25.0549	25.6688	26.3373	27.3502	28.5137	29.4637	(42b)

Hot water usage for other uses

41.6522	40.1376	38.6230	37.1084	35.5937	34.0791	34.0791	35.5937	37.1084	38.6230	40.1376	41.6522	(42c)

Average daily hot water use (litres/day) 128.3946 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	139.6769	136.6944	133.0622	127.5391	123.0540	118.2321	116.3790	119.9955	123.8096	128.8717	134.4799	139.3147	(44)
Energy conte	221.2141	194.6510	204.5117	174.5947	165.6543	145.3802	140.7503	148.5795	152.6696	174.8777	191.5913	218.1331	(45)

Energy content (annual) Total = Sum(45)m = 2132.6075
Distribution loss (46)m = 0.15 x (45)m

33.1821	29.1976	30.6768	26.1892	24.8482	21.8070	21.1126	22.2869	22.9004	26.2317	28.7387	32.7200	(46)

Water storage loss:
Store volume 210.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.5800 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.8532 (55)
Total storage loss

26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(56)

If cylinder contains dedicated solar storage

26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

270.9257	239.5518	254.2233	222.7027	215.3659	193.4882	190.4619	198.2911	200.7776	224.5893	239.6993	267.8447	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

270.9257	239.5518	254.2233	222.7027	215.3659	193.4882	190.4619	198.2911	200.7776	224.5893	239.6993	267.8447	(64)

Total per year (kWh/year) = Sum(64)m = 2717.9215 (64)
12Total per year (kWh/year) 2718 (64)
Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)
Heat gains from water heating, kWh/month

113.3230	100.6421	107.7694	96.5391	94.8493	86.8253	86.5688	89.1720	89.2490	97.9161	102.1905	112.2985	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

145.9975	161.6401	145.9975	150.8641	145.9975	150.8641	145.9975	145.9975	150.8641	145.9975	150.8641	145.9975	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

240.8328	243.3319	237.0343	223.6274	206.7036	190.7976	180.1714	177.6723	183.9699	197.3768	214.3007	230.2066	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	(71)

Water heating gains (Table 5)

152.3158	149.7650	144.8514	134.0821	127.4857	120.5907	116.3559	119.8548	123.9570	131.6077	141.9313	150.9389	(72)

Total internal gains

601.7256	617.3165	590.4626	571.1531	542.7662	524.8319	505.1042	506.1041	521.3705	537.5615	569.6755	589.7225	(73)

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6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains

		m2	Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	factor Table 6d	W	
East		4.9800	19.6403	0.3000	0.0000	0.7700	22.5938	(76)
West		3.5300	19.6403	0.3000	0.0000	0.7700	16.0153	(80)

Solar gains	38.6090	75.5274	124.3829	181.4051	222.3188	227.5828	216.6681	186.1147	144.6625	89.6197	48.1409	31.7502	(83)
Total gains	640.3346	692.8439	714.8456	752.5582	765.0850	752.4147	721.7724	692.2188	666.0330	627.1812	617.8164	621.4727	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	29.5163	29.6858	29.8573	30.7453	30.9292	31.8832	31.8832	32.0811	31.4946	30.9292	30.5635	30.2062	
alpha	2.9678	2.9791	2.9905	3.0497	3.0619	3.1255	3.1255	3.1387	3.0996	3.0619	3.0376	3.0137	
util living area	0.9257	0.9043	0.8731	0.7999	0.6927	0.5314	0.4005	0.4303	0.6197	0.8090	0.8948	0.9301	(86)
Living	19.2059	19.4405	19.7783	20.2732	20.6431	20.8917	20.9664	20.9577	20.8146	20.3581	19.7568	19.2090	
Non living	18.5914	18.8234	19.1557	19.6451	19.9905	20.2218	20.2776	20.2761	20.1543	19.7347	19.1505	18.6062	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.0822	19.4405	19.7783	20.2732	20.6431	20.8917	20.9664	20.9577	20.8146	20.3581	19.7568	19.4595	(87)
Th 2	20.2432	20.2472	20.2512	20.2713	20.2753	20.2956	20.2956	20.2996	20.2875	20.2753	20.2673	20.2592	(88)
util rest of house	0.9178	0.8943	0.8594	0.7783	0.6591	0.4833	0.3413	0.3709	0.5731	0.7843	0.8824	0.9227	(89)
MIT 2	19.3982	18.8234	19.1557	19.6451	19.9905	20.2218	20.2776	20.2761	20.1543	19.7347	19.1505	18.8374	(90)
Living area fraction									fLA = Living area / (4) =			0.3196	(91)
MIT	19.6168	19.0206	19.3547	19.8458	20.1991	20.4359	20.4977	20.4939	20.3653	19.9339	19.3443	19.0362	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6168	19.0206	19.3547	19.8458	20.1991	20.4359	20.4977	20.4939	20.3653	19.9339	19.3443	19.0362	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9104	0.8750	0.8406	0.7644	0.6553	0.4932	0.3586	0.3877	0.5784	0.7714	0.8641	0.9082	(94)
Useful gains	582.9793	606.2386	600.8828	575.2925	501.3654	371.0947	258.8479	268.3853	385.2521	483.8220	533.8636	564.4085	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1130.9558	1036.6772	938.3184	775.9072	598.8824	398.9171	266.4323	278.1170	433.5571	657.7081	873.1091	1070.4479	(97)
Space heating kWh	407.6946	289.2547	251.0521	144.4425	72.5527	0.0000	0.0000	0.0000	0.0000	129.3713	244.2568	376.4933	(98a)
Space heating requirement - total per year (kWh/year)												1915.1180	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	407.6946	289.2547	251.0521	144.4425	72.5527	0.0000	0.0000	0.0000	0.0000	129.3713	244.2568	376.4933	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1915.1180	
Space heating per m2											(98c) / (4) =	21.0545	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Efficiency of main space heating system 1 (in %)	270.8847 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	407.6946	289.2547	251.0521	144.4425	72.5527	0.0000	0.0000	0.0000	0.0000	129.3713	244.2568	376.4933	(98)
Space heating efficiency (main heating system 1)	270.8847	270.8847	270.8847	270.8847	0.0000	0.0000	0.0000	0.0000	270.8847	270.8847	270.8847	270.8847	(210)
Space heating fuel (main heating system)	150.5048	106.7815	92.6786	53.3225	26.7836	0.0000	0.0000	0.0000	0.0000	47.7588	90.1700	138.9866	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	270.9257	239.5518	254.2233	222.7027	215.3659	193.4882	190.4619	198.2911	200.7776	224.5893	239.6993	267.8447	(64)
Efficiency of water heater												281.0493	(216)
(217)m	281.0493	281.0493	281.0493	281.0493	281.0493	281.0493	281.0493	281.0493	281.0493	281.0493	281.0493	281.0493	(217)
Fuel for water heating, kWh/month	96.3979	85.2348	90.4551	79.2397	76.6292	68.8449	67.7682	70.5539	71.4386	79.9110	85.2873	95.3017	(219)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	29.6563	26.7864	29.6563	28.6997	29.6563	28.6997	29.6563	29.6563	28.6997	29.6563	28.6997	29.6563	(231)
Lighting	30.8703	24.7653	22.2984	16.3368	12.6190	10.3098	11.5115	14.9631	19.4355	25.5005	28.8027	31.7283	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	706.9864	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	281.0493	
Water heating fuel used	967.0623	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.1900)		
mechanical ventilation fans (SFP = 1.1900)	349.1794	(230a)
Total electricity for the above, kWh/year	349.1794	(231)
Electricity for lighting (calculated in Appendix L)	249.1413	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2272.3695	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	706.9864	0.1552	109.7234	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	967.0623	0.1410	136.3181	(264)
Space and water heating			246.0414	(265)
Pumps, fans and electric keep-hot	349.1794	0.1387	48.4355	(267)
Energy for lighting	249.1413	0.1443	35.9588	(268)
Total CO2, kg/year			330.4357	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.6300	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	706.9864	1.5746	1113.1910	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	967.0623	1.5212	1471.1200	(278)
Space and water heating			2584.3110	(279)
Pumps, fans and electric keep-hot	349.1794	1.5128	528.2386	(281)
Energy for lighting	249.1413	1.5338	382.1413	(282)
Total Primary energy kWh/year			3494.6909	(286)
Dwelling Primary energy Rate (DPER)			38.4200	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	41.1800	(1b)	x 2.4800	(2b) =	102.1264	(1b) - (3b)
First floor	49.7800	(1c)	x 2.7800	(2c) =	138.3884	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	90.9600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		240.5148	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1247	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3747	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3185	(21)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4061	0.3982	0.3902	0.3504	0.3424	0.3026	0.3026	0.2946	0.3185	0.3424	0.3583	0.3743 (22b)
Effective ac	0.5825	0.5793	0.5761	0.5614	0.5586	0.5458	0.5458	0.5434	0.5507	0.5586	0.5642	0.5700 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			4.1400	1.0000	4.1400			(26)
TER Opening Type			8.5100	1.1450	9.7443			(27)
GF			41.1800	0.1300	5.3534			(28a)
Exposed Floor			8.6000	0.1300	1.1180			(28b)
Main	71.8472	12.6500	59.1972	0.1800	10.6555			(29a)
PIJ	49.7800		49.7800	0.1100	5.4758			(30)
Total net area of external elements Aum(A, m2)			171.4072					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	36.4870			(33)
Main dwelling								
Party Wall 1			81.2200	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 86.2563 (35)

List of Thermal Bridges

	Length	Psi-value	Total	
K1 Element				
E2 Other lintels (including other steel lintels)	8.6300	0.0500	0.4315	
E3 Sill	8.6300	0.0500	0.4315	
E4 Jamb	28.2000	0.0500	1.4100	
E5 Ground floor (normal)	16.6400	0.1600	2.6624	
E16 Corner (normal)	4.9600	0.0900	0.4464	
E12 Gable (insulation at ceiling level)	11.0000	0.0600	0.6600	
E6 Intermediate floor within a dwelling	11.0000	0.0000	0.0000	
E17 Corner (inverted - internal area greater than external area)	4.9600	-0.0900	-0.4464	
P1 Party wall - Ground floor	12.4600	0.0800	0.9968	
E20 Exposed floor (normal)	6.4400	0.3200	2.0608	
E21 Exposed floor (inverted)	12.0800	0.3200	3.8656	
E18 Party wall between dwellings	11.1200	0.0600	0.6672	
P4 Party wall - Roof (insulation at ceiling level)	18.1000	0.1200	2.1720	
E25 Staggered party wall between dwellings	9.9200	0.0600	0.5952	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 15.9530 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 52.4400 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	46.2302	45.9760	45.7269	44.5568	44.3378	43.3187	43.3187	43.1299	43.7112	44.3378	44.7807	45.2438	(38)
Heat transfer coeff	98.6702	98.4160	98.1669	96.9967	96.7778	95.7586	95.7586	95.5699	96.1512	96.7778	97.2207	97.6837	(39)
Average = Sum(39)m / 12 =												96.9957	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0848	1.0820	1.0792	1.0664	1.0640	1.0528	1.0528	1.0507	1.0571	1.0640	1.0688	1.0739	(40)
HLP (average)												1.0664	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6386 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	68.4610	67.4321	65.9329	63.0644	60.9476	58.5869	57.2450	58.7329	60.3639	62.8986	65.8287	68.1987	(42a)
Hot water usage for baths	29.5637	29.1246	28.5063	27.3663	26.5127	25.5661	25.0549	25.6688	26.3373	27.3502	28.5137	29.4637	(42b)
Hot water usage for other uses	41.6522	40.1376	38.6230	37.1084	35.5937	34.0791	34.0791	35.5937	37.1084	38.6230	40.1376	41.6522	(42c)
Average daily hot water use (litres/day)												128.3946	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	139.6769	136.6944	133.0622	127.5391	123.0540	118.2321	116.3790	119.9955	123.8096	128.8717	134.4799	139.3147	(44)
Energy conte	221.2141	194.6510	204.5117	174.5947	165.6543	145.3802	140.7503	148.5795	152.6696	174.8777	191.5913	218.1331	(45)
Energy content (annual)										Total = Sum(45)m =		2132.6075	
Distribution loss (46)m = 0.15 x (45)m	33.1821	29.1976	30.6768	26.1892	24.8482	21.8070	21.1126	22.2869	22.9004	26.2317	28.7387	32.7200	(46)
Water storage loss:													
Store volume												210.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7016	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.9188	(55)
Total storage loss	28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842	(56)
If cylinder contains dedicated solar storage	28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	272.9607	241.3898	256.2583	224.6720	217.4009	195.4575	192.4969	200.3261	202.7469	226.6243	241.6687	269.8797	(62)
WWHRS	-31.2975	-27.6798	-28.9847	-24.0004	-22.3675	-19.1401	-17.9408	-19.0782	-19.8031	-23.3456	-26.4477	-30.7179	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	241.6632	213.7101	227.2737	200.6716	195.0334	176.3175	174.5562	181.2479	182.9439	203.2787	215.2209	239.1618	(64)
										Total per year (kWh/year) = Sum(64)m =		2451.0786	(64)
12Total per year (kWh/year)												2451	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	114.9510	102.1125	109.3974	98.1146	96.4773	88.4008	88.1968	90.7999	90.8245	99.5441	103.7660	113.9265	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	142.2156	157.4530	142.2156	146.9561	142.2156	146.9561	142.2156	142.2156	146.9561	142.2156	146.9561	142.2156	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	240.8328	243.3319	237.0343	223.6274	206.7036	190.7976	180.1714	177.6723	183.9699	197.3768	214.3007	230.2066	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	(71)

Water heating gains (Table 5)

	154.5040	151.9532	147.0395	136.2703	129.6738	122.7789	118.5440	122.0429	126.1452	133.7959	144.1194	153.1270	(72)

Total internal gains

	603.1319	618.3176	591.8689	572.4333	544.1725	523.1121	503.5105	504.5103	519.6507	538.9678	570.9557	591.1288	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	4.9800	19.6403	0.6300	0.7000	0.7700	29.8916	(76)
West	3.5300	19.6403	0.6300	0.7000	0.7700	21.1882	(80)

Solar gains	51.0797	99.9228	164.5586	239.9990	294.1277	301.0921	286.6519	246.2298	191.3885	118.5668	63.6904	42.0055	(83)
Total gains	654.2116	718.2404	756.4276	812.4323	838.3003	824.2042	790.1625	750.7401	711.0392	657.5346	634.6461	633.1343	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	22.0878	22.1449	22.2011	22.4689	22.5197	22.7594	22.7594	22.8043	22.6665	22.5197	22.4171	22.3109	
alpha	2.4725	2.4763	2.4801	2.4979	2.5013	2.5173	2.5173	2.5203	2.5111	2.5013	2.4945	2.4874	
util living area	0.9360	0.9177	0.8901	0.8304	0.7393	0.6039	0.4758	0.5113	0.6900	0.8457	0.9133	0.9404	(86)
MIT	18.4055	18.6788	19.1165	19.7406	20.2920	20.7078	20.8849	20.8584	20.5623	19.8623	19.0543	18.3688	(87)
Th 2	20.0133	20.0156	20.0178	20.0284	20.0304	20.0396	20.0396	20.0413	20.0360	20.0304	20.0264	20.0222	(88)
util rest of house	0.9279	0.9074	0.8758	0.8069	0.7003	0.5405	0.3887	0.4252	0.6331	0.8197	0.9008	0.9329	(89)
MIT 2	16.9801	17.3251	17.8765	18.6558	19.3201	19.7941	19.9672	19.9474	19.6441	18.8191	17.8103	16.9389	(90)
Living area fraction									fLA = Living area / (4) =			0.3196	(91)
MIT	17.4357	17.7577	18.2728	19.0025	19.6307	20.0861	20.2605	20.2386	19.9375	19.1525	18.2078	17.3959	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.4357	17.7577	18.2728	19.0025	19.6307	20.0861	20.2605	20.2386	19.9375	19.1525	18.2078	17.3959	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8993	0.8764	0.8434	0.7775	0.6822	0.5438	0.4098	0.4440	0.6266	0.7911	0.8703	0.9053	(94)
Useful gains	588.3189	629.4443	637.9923	631.6314	571.9223	448.2148	323.7839	333.2941	445.5711	520.1449	552.3117	573.1478	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1296.0984	1265.4063	1155.6998	979.9051	767.5179	525.3461	350.5219	366.8520	561.2863	827.6930	1079.9121	1289.0229	(97)
Space heating kWh	526.5880	427.3664	385.1743	250.7571	145.5232	0.0000	0.0000	0.0000	0.0000	228.8158	379.8723	532.6111	(98a)
Space heating requirement - total per year (kWh/year)												2876.7082	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	526.5880	427.3664	385.1743	250.7571	145.5232	0.0000	0.0000	0.0000	228.8158	379.8723	532.6111	(98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												2876.7082	
Space heating per m2											(98c) / (4) =	31.6261	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	526.5880	427.3664	385.1743	250.7571	145.5232	0.0000	0.0000	0.0000	0.0000	228.8158	379.8723	532.6111	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	570.5179	463.0189	417.3070	271.6761	157.6632	0.0000	0.0000	0.0000	0.0000	247.9044	411.5627	577.0434	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	241.6632	213.7101	227.2737	200.6716	195.0334	176.3175	174.5562	181.2479	182.9439	203.2787	215.2209	239.1618	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.7576	85.5823	85.2328	84.5606	83.4125	79.8000	79.8000	79.8000	79.8000	84.3258	85.3199	85.8013	(217)
Fuel for water heating, kWh/month	281.7980	249.7128	266.6504	237.3110	233.8180	220.9492	218.7421	227.1276	229.2530	241.0634	252.2517	278.7391	(219)

Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	29.5496	23.7058	21.3444	15.6378	12.0791	9.8687	11.0190	14.3229	18.6040	24.4095	27.5704	30.3709	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-38.9812	-55.1702	-79.5760	-89.7571	-96.9883	-90.5718	-89.4598	-84.3870	-75.4216	-63.2498	-42.9366	-33.6769	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-21.3144	-44.9402	-89.5251	-134.7575	-178.4789	-179.4591	-177.3409	-150.0006	-109.7478	-64.3537	-28.4842	-16.8460	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	3116.6936	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2937.4164	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	238.4821	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-2035.4247	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	4343.1674	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3116.6936	0.2100	654.5057	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2937.4164	0.2100	616.8574	(264)
Space and water heating			1271.3631	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	238.4821	0.1443	34.4203	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-840.1762	0.1345	-113.0202	
PV Unit electricity exported	-1195.2485	0.1258	-150.3985	
Total			-263.4187	(269)
Total CO2, kg/year			1054.2940	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.5900	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	3116.6936	1.1300	3521.8638	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2937.4164	1.1300	3319.2805	(278)
Space and water heating			6841.1443	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	238.4821	1.5338	365.7919	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-840.1762	1.4972	-1257.8767	
PV Unit electricity exported	-1195.2485	0.4619	-552.0620	
Total			-1809.9387	(283)
Total Primary energy kWh/year			5527.0983	(286)
Target Primary Energy Rate (TPER)			60.7600	(287)

Full SAP Calculation Printout

Property Reference	78449-10	**Issued on Date**	03/10/2025
Assessment Reference	001	**Prop Type Ref**	Mid
Property	836 Rochdale Road, MANCHESTER, M9 8FA		

SAP Rating	84 B	**DER**	3.63	**TER**	11.59
Environmental	97 A	**% DER < TER**			68.68
CO_2 Emissions (t/year)	0.32	**DFEE**	34.22	**TFEE**	37.64
Compliance Check	See BREL	**% DFEE < TFEE**			9.08
% DPER < TPER	36.77	**DPER**	38.42	**TPER**	60.76

Assessor Details	Mr. Daniel Goddard	**Assessor ID**	CP52-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	41.1800 (1b)	x	2.4800 (2b)	=	102.1264	(1b) - (3b)
First floor	49.7800 (1c)	x	2.7800 (2c)	=	138.3884	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	90.9600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	240.5148	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1247	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3747	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3185	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4061	0.3982	0.3902	0.3504	0.3424	0.3026	0.3026	0.2946	0.3185	0.3424	0.3583	0.3743	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5825	0.5793	0.5761	0.5614	0.5586	0.5458	0.5458	0.5434	0.5507	0.5586	0.5642	0.5700	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door			4.1400	1.0000	4.1400			(26)
Window			8.5100	0.7752	6.5969			(27)
GF			41.1800	0.0900	3.7062	75.0000	3088.5000	(28a)
Exposed Floor			8.6000	0.1400	1.2040	20.0000	172.0000	(28b)
Main	71.8472	12.6500	59.1972	0.1300	7.6956	9.0000	532.7748	(29a)
PIJ	49.7800		49.7800	0.1300	6.4714	9.0000	448.0200	(30)
Total net area of external elements Aum(A, m2)			171.4072					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	29.8141			(33)
Main dwelling								
Party Wall 1			81.2200	0.0000	0.0000	20.0000	1624.4000	(32)
Timber			96.4800			9.0000	868.3200	(32c)
FF			41.1800			18.0000	741.2400	(32d)
GF			41.1800			9.0000	370.6200	(32e)
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =			7845.8748	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							86.2563	(35)
List of Thermal Bridges								

	Length	Psi-value	Total	
K1 Element				
E2 Other lintels (including other steel lintels)	8.6300	0.1150	0.9925	
E3 Sill	8.6300	0.0170	0.1467	
E4 Jamb	28.2000	0.0940	2.6508	
E5 Ground floor (normal)	16.6400	0.0670	1.1149	
E16 Corner (normal)	4.9600	0.0680	0.3373	
E12 Gable (insulation at ceiling level)	11.0000	0.0770	0.8470	
E6 Intermediate floor within a dwelling	11.0000	0.0320	0.3520	
E17 Corner (inverted - internal area greater than external area)	4.9600	-0.0290	-0.1438	
P1 Party wall - Ground floor	12.4600	0.3200	3.9872	
E20 Exposed floor (normal)	6.4400	0.0790	0.5088	
E21 Exposed floor (inverted)	12.0800	0.0630	0.7610	
E18 Party wall between dwellings	11.1200	0.0920	1.0230	
P4 Party wall - Roof (insulation at ceiling level)	18.1000	0.1020	1.8462	
E25 Staggered party wall between dwellings	9.9200	0.0560	0.5555	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			14.9790	(36)
Point Thermal bridges		(36a) =	0.0000	
Total fabric heat loss		(33) + (36) + (36a) =	44.7932	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	46.2302	45.9760	45.7269	44.5568	44.3378	43.3187	43.3187	43.1299	43.7112	44.3378	44.7807	45.2438	(38)
Heat transfer coeff	91.0234	90.7692	90.5201	89.3499	89.1310	88.1119	88.1119	87.9231	88.5044	89.1310	89.5739	90.0369	(39)
Average = Sum(39)m / 12 =												89.3489	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0007	0.9979	0.9952	0.9823	0.9799	0.9687	0.9687	0.9666	0.9730	0.9799	0.9848	0.9899	(40)
HLP (average)												0.9823	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Assumed occupancy												2.6386	(42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	29.5637	29.1246	28.5063	27.3663	26.5127	25.5661	25.0549	25.6688	26.3373	27.3502	28.5137	29.4637	(42b)
Hot water usage for other uses	41.6522	40.1376	38.6230	37.1084	35.5937	34.0791	34.0791	35.5937	37.1084	38.6230	40.1376	41.6522	(42c)
Average daily hot water use (litres/day)												65.2759	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	71.2159	69.2622	67.1293	64.4747	62.1064	59.6452	59.1340	61.2626	63.4457	65.9732	68.6513	71.1160	(44)
Energy conte	112.7886	98.6285	103.1753	88.2626	83.6072	73.3408	71.5174	75.8559	78.2349	89.5249	97.8063	111.3504	(45)
Energy content (annual)										Total = Sum(45)m =		1084.0928	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	95.8703	83.8342	87.6990	75.0232	71.0661	62.3397	60.7898	64.4775	66.4996	76.0962	83.1354	94.6479	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	95.8703	83.8342	87.6990	75.0232	71.0661	62.3397	60.7898	64.4775	66.4996	76.0962	83.1354	94.6479	(64)
										Total per year (kWh/year) = Sum(64)m =		921.4789	(64)
12Total per year (kWh/year)												921	(64)
Electric shower(s)	54.8258	48.8503	53.3426	50.9042	51.8594	49.4688	51.1178	51.8594	50.9042	53.3426	52.3396	54.8258	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		623.6406	(64a)
Heat gains from water heating, kWh/month	37.6740	33.1711	35.2604	31.4819	30.7314	27.9521	27.9769	29.0842	29.3510	32.3597	33.8687	37.3684	(65)

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5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	145.9975	161.6401	145.9975	150.8641	145.9975	150.8641	145.9975	145.9975	150.8641	145.9975	150.8641	145.9975	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	240.8328	243.3319	237.0343	223.6274	206.7036	190.7976	180.1714	177.6723	183.9699	197.3768	214.3007	230.2066	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	(71)
Water heating gains (Table 5)	50.6372	49.3618	47.3930	43.7248	41.3056	38.8224	37.6034	39.0917	40.7652	43.4942	47.0399	50.2264	(72)
Total internal gains	500.0470	516.9133	493.0043	480.7957	456.5862	443.0635	426.3517	425.3410	438.1787	449.4480	474.7841	489.0100	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	4.9800	19.6403	0.3000	0.0000	0.7700	22.5938	(76)
West	3.5300	19.6403	0.3000	0.0000	0.7700	16.0153	(80)

Solar gains	38.6090	75.5274	124.3829	181.4051	222.3188	227.5828	216.6681	186.1147	144.6625	89.6197	48.1409	31.7502	(83)
Total gains	538.6560	592.4407	617.3872	662.2009	678.9049	670.6464	643.0199	611.4557	582.8412	539.0677	522.9250	520.7602	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	23.9434	24.0105	24.0765	24.3918	24.4518	24.7346	24.7346	24.7877	24.6249	24.4518	24.3309	24.2057	
alpha	2.5962	2.6007	2.6051	2.6261	2.6301	2.6490	2.6490	2.6525	2.6417	2.6301	2.6221	2.6137	
util living area	0.9553	0.9409	0.9205	0.8713	0.7924	0.6605	0.5285	0.5654	0.7421	0.8831	0.9377	0.9587	(86)
MIT	18.3957	18.6561	19.0682	19.6845	20.2400	20.6826	20.8745	20.8458	20.5334	19.8223	19.0327	18.3640	(87)
Th 2	20.0828	20.0851	20.0874	20.0981	20.1001	20.1095	20.1095	20.1112	20.1059	20.1001	20.0961	20.0918	(88)
util rest of house	0.9496	0.9334	0.9098	0.8526	0.7590	0.6012	0.4423	0.4813	0.6912	0.8625	0.9285	0.9535	(89)
MIT 2	17.6867	17.9450	18.3528	18.9606	19.4904	19.8937	20.0444	20.0272	19.7689	19.1029	18.3273	17.6614	(90)
Living area fraction										fLA = Living area / (4) =		0.3196	(91)
MIT	17.9133	18.1723	18.5814	19.1920	19.7300	20.1459	20.3097	20.2888	20.0132	19.3328	18.5527	17.8859	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.9133	18.1723	18.5814	19.1920	19.7300	20.1459	20.3097	20.2888	20.0132	19.3328	18.5527	17.8859	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9316	0.9130	0.8875	0.8302	0.7434	0.6038	0.4629	0.4993	0.6853	0.8411	0.9082	0.9364	(94)
Useful gains	501.7981	540.8973	547.9198	549.7682	504.6789	404.9694	297.6235	305.2822	399.4211	453.4351	474.9412	487.6325	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1239.1269	1204.7135	1093.6108	919.5872	715.7213	488.6558	326.8695	341.9194	523.3451	778.3676	1025.8637	1232.2388	(97)
Space heating kWh	548.5726	446.0845	405.9941	266.2697	157.0156	0.0000	0.0000	0.0000	0.0000	241.7498	396.6642	553.9871	(98a)
Space heating requirement - total per year (kWh/year)												3016.3375	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	548.5726	446.0845	405.9941	266.2697	157.0156	0.0000	0.0000	0.0000	0.0000	241.7498	396.6642	553.9871	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3016.3375	
Space heating per m2											(98c) / (4) =	33.1611	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	828.2514	652.0277	668.2157	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.6672	0.7409	0.7138	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	552.6268	483.0982	476.9890	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	708.6181	679.8104	645.9957	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	112.3137	146.3539	125.7410	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	28.0784	36.5885	31.4352	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												96.1022	(107)
Energy for space heating												33.1611	(99)
Energy for space cooling												1.0565	(108)
Total												34.2177	(109)
Fabric Energy Efficiency (DFEE)												34.2	(109)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	41.1800	(1b)	x 2.4800	(2b) =	102.1264	(1b) - (3b)
First floor	49.7800	(1c)	x 2.7800	(2c) =	138.3884	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	90.9600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		240.5148	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)

Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1247	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3747	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3185	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													
	0.4061	0.3982	0.3902	0.3504	0.3424	0.3026	0.3026	0.2946	0.3185	0.3424	0.3583	0.3743	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0.0000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5825	0.5793	0.5761	0.5614	0.5586	0.5458	0.5458	0.5434	0.5507	0.5586	0.5642	0.5700	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			4.1400	1.0000	4.1400			(26)
TER Opening Type			8.5100	1.1450	9.7443			(27)
GF			41.1800	0.1300	5.3534			(28a)
Exposed Floor			8.6000	0.1300	1.1180			(28b)
Main	71.8472	12.6500	59.1972	0.1800	10.6555			(29a)
PIJ	49.7800		49.7800	0.1100	5.4758			(30)
Total net area of external elements Aum(A, m2)			171.4072					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	36.4870			(33)
Main dwelling								
Party Wall 1			81.2200	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 86.2563 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	8.6300	0.0500	0.4315
E3 Sill	8.6300	0.0500	0.4315
E4 Jamb	28.2000	0.0500	1.4100
E5 Ground floor (normal)	16.6400	0.1600	2.6624
E16 Corner (normal)	4.9600	0.0900	0.4464
E12 Gable (insulation at ceiling level)	11.0000	0.0600	0.6600
E6 Intermediate floor within a dwelling	11.0000	0.0000	0.0000
E17 Corner (inverted - internal area greater than external area)	4.9600	-0.0900	-0.4464
P1 Party wall - Ground floor	12.4600	0.0800	0.9968
E20 Exposed floor (normal)	6.4400	0.3200	2.0608
E21 Exposed floor (inverted)	12.0800	0.3200	3.8656
E18 Party wall between dwellings	11.1200	0.0600	0.6672
P4 Party wall - Roof (insulation at ceiling level)	18.1000	0.1200	2.1720
E25 Staggered party wall between dwellings	9.9200	0.0600	0.5952

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		15.9530 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	52.4400 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	46.2302	45.9760	45.7269	44.5568	44.3378	43.3187	43.3187	43.1299	43.7112	44.3378	44.7807	45.2438	(38)
Heat transfer coeff													
	98.6702	98.4160	98.1669	96.9967	96.7778	95.7586	95.7586	95.5699	96.1512	96.7778	97.2207	97.6837	(39)
Average = Sum(39)m / 12 =												96.9957	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0848	1.0820	1.0792	1.0664	1.0640	1.0528	1.0528	1.0507	1.0571	1.0640	1.0688	1.0739	(40)
HLP (average)												1.0664	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.6386 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

29.5637	29.1246	28.5063	27.3663	26.5127	25.5661	25.0549	25.6688	26.3373	27.3502	28.5137	29.4637	(42b)

Hot water usage for other uses

41.6522	40.1376	38.6230	37.1084	35.5937	34.0791	34.0791	35.5937	37.1084	38.6230	40.1376	41.6522	(42c)

Average daily hot water use (litres/day)	65.2759 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	71.2159	69.2622	67.1293	64.4747	62.1064	59.6452	59.1340	61.2626	63.4457	65.9732	68.6513	71.1160	(44)
Energy conte	112.7886	98.6285	103.1753	88.2626	83.6072	73.3408	71.5174	75.8559	78.2349	89.5249	97.8063	111.3504	(45)
Energy content (annual)										Total = Sum(45)m =		1084.0928	
Distribution loss (46)m = 0.15 x (45)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	95.8703	83.8342	87.6990	75.0232	71.0661	62.3397	60.7898	64.4775	66.4996	76.0962	83.1354	94.6479	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)

FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	95.8703	83.8342	87.6990	75.0232	71.0661	62.3397	60.7898	64.4775	66.4996	76.0962	83.1354	94.6479	(64)
										Total per year (kWh/year) = Sum(64)m =		921.4789	(64)
12Total per year (kWh/year)												921	(64)
Electric shower(s)	54.8258	48.8503	53.3426	50.9042	51.8594	49.4688	51.1178	51.8594	50.9042	53.3426	52.3396	54.8258	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		623.6406	(64a)
Heat gains from water heating, kWh/month	37.6740	33.1711	35.2604	31.4819	30.7314	27.9521	27.9769	29.0842	29.3510	32.3597	33.8687	37.3684	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	142.2156	157.4530	142.2156	146.9561	142.2156	146.9561	142.2156	142.2156	146.9561	142.2156	146.9561	142.2156	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	240.8328	243.3319	237.0343	223.6274	206.7036	190.7976	180.1714	177.6723	183.9699	197.3768	214.3007	230.2066	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	(71)
Water heating gains (Table 5)	50.6372	49.3618	47.3930	43.7248	41.3056	38.8224	37.6034	39.0917	40.7652	43.4942	47.0399	50.2264	(72)
Total internal gains	496.2651	512.7262	489.2224	476.8878	452.8043	439.1556	422.5699	421.5591	434.2708	445.6662	470.8762	485.2281	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	4.9800	19.6403	0.6300	0.7000	0.7700	29.8916	(76)
West	3.5300	19.6403	0.6300	0.7000	0.7700	21.1882	(80)

Solar gains	51.0797	99.9228	164.5586	239.9990	294.1277	301.0921	286.6519	246.2298	191.3885	118.5668	63.6904	42.0055	(83)
Total gains	547.3448	612.6490	653.7810	716.8868	746.9320	740.2477	709.2218	667.7889	625.6593	564.2330	534.5666	527.2336	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	22.0878	22.1449	22.2011	22.4689	22.5197	22.7594	22.7594	22.8043	22.6665	22.5197	22.4171	22.3109	
alpha	2.4725	2.4763	2.4801	2.4979	2.5013	2.5173	2.5173	2.5203	2.5111	2.5013	2.4945	2.4874	
util living area	0.9553	0.9395	0.9159	0.8618	0.7774	0.6454	0.5167	0.5565	0.7358	0.8810	0.9378	0.9589	(86)
MIT	18.1813	18.4692	18.9293	19.5971	20.1934	20.6573	20.8607	20.8274	20.4857	19.7132	18.8568	18.1428	(87)
Th 2	20.0133	20.0156	20.0178	20.0284	20.0304	20.0396	20.0396	20.0413	20.0360	20.0304	20.0264	20.0222	(88)
util rest of house	0.9493	0.9315	0.9042	0.8412	0.7411	0.5823	0.4257	0.4674	0.6816	0.8592	0.9282	0.9535	(89)
MIT 2	17.4304	17.7155	18.1700	18.8263	19.3922	19.8117	19.9700	19.9503	19.6706	18.9496	18.1090	17.3981	(90)
Living area fraction										fLA = Living area / (4) =		0.3196	(91)
MIT	17.6704	17.9564	18.4127	19.0726	19.6482	20.0820	20.2547	20.2306	19.9311	19.1936	18.3480	17.6361	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.6704	17.9564	18.4127	19.0726	19.6482	20.0820	20.2547	20.2306	19.9311	19.1936	18.3480	17.6361	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9303	0.9095	0.8799	0.8170	0.7248	0.5854	0.4474	0.4863	0.6750	0.8360	0.9066	0.9354	(94)
Useful gains	509.1687	557.2223	575.2474	585.7154	541.3866	433.3140	317.2871	324.7498	422.3123	471.6937	484.6376	493.1838	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1319.2565	1284.9585	1169.4306	986.7115	769.2141	524.9448	349.9653	366.0891	560.6671	831.6736	1093.5350	1312.4905	(97)
Space heating kWh	602.7053	489.0387	442.0723	288.7172	169.5036	0.0000	0.0000	0.0000	0.0000	267.8250	438.4062	609.5642	(98a)
Space heating requirement - total per year (kWh/year)												3307.8326	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	602.7053	489.0387	442.0723	288.7172	169.5036	0.0000	0.0000	0.0000	0.0000	267.8250	438.4062	609.5642	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3307.8326	
Space heating per m2											(98c) / (4) =	36.3658	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	900.1313	708.6140	726.3314	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.6696	0.7408	0.7107	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	602.7506	524.9696	516.1911	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	794.2071	761.2522	715.7953	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	137.8487	175.7942	148.5055	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)

Intermittency factor (Table 10b)

0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)

Space cooling kWh

0.0000	0.0000	0.0000	0.0000	0.0000	34.4622	43.9486	37.1264	0.0000	0.0000	0.0000	0.0000	(107)

Space cooling requirement	115.5371	(107)
Energy for space heating	36.3658	(99)
Energy for space cooling	1.2702	(108)
Total	37.6360	(109)
Fabric Energy Efficiency (TFEE)	37.6	(109)

Full SAP Calculation Printout

Property Reference	78449-10	**Issued on Date**	03/10/2025
Assessment Reference	001	**Prop Type Ref**	Mid
Property	836 Rochdale Road, MANCHESTER, M9 8FA		

SAP Rating	84 B	**DER**	3.63	**TER**	11.59
Environmental	97 A	**% DER < TER**			68.68
CO_2 Emissions (t/year)	0.32	**DFEE**	34.22	**TFEE**	37.64
Compliance Check	See BREL	**% DFEE < TFEE**			9.08
% DPER < TPER	36.77	**DPER**	38.42	**TPER**	60.76

Assessor Details	Mr. Daniel Goddard	**Assessor ID**	CP52-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	41.1800 (1b)	x	2.4800 (2b)	=	102.1264	(1b) - (3b)
First floor	49.7800 (1c)	x	2.7800 (2c)	=	138.3884	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	90.9600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	240.5148	(5)

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2. Ventilation rate

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				m3 per hour	
Number of open chimneys			0 * 80 =	0.0000	(6a)
Number of open flues			0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire			0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler			0 * 20 =	0.0000	(6d)
Number of flues attached to other heater			0 * 35 =	0.0000	(6e)
Number of blocked chimneys			0 * 20 =	0.0000	(6f)
Number of intermittent extract fans			0 * 10 =	0.0000	(7a)
Number of passive vents			0 * 10 =	0.0000	(7b)
Number of flueless gas fires			0 * 40 =	0.0000	(7c)
				Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =			0.0000 / (5) =	0.0000	(8)
Pressure test				Yes	
Pressure Test Method				Blower Door	
Measured/design AP50				5.0000	(17)
Infiltration rate				0.2500	(18)
Number of sides sheltered				2	(19)
Shelter factor			(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =	0.2125	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2709	0.2656	0.2603	0.2338	0.2284	0.2019	0.2019	0.1966	0.2125	0.2284	0.2391	0.2497	(22b)

Balanced mechanical ventilation with heat recovery		
If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	81.0000	(23c)

Effective ac	0.3659	0.3606	0.3553	0.3287	0.3234	0.2969	0.2969	0.2916	0.3075	0.3234	0.3341	0.3447	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door			4.1400	1.0000	4.1400			(26)
Window			8.5100	0.7752	6.5969			(27)
GF			41.1800	0.0900	3.7062	75.0000	3088.5000	(28a)
Exposed Floor			8.6000	0.1400	1.2040	20.0000	172.0000	(28b)
Main	71.8472	12.6500	59.1972	0.1300	7.6956	9.0000	532.7748	(29a)
PIJ	49.7800		49.7800	0.1300	6.4714	9.0000	448.0200	(30)
Total net area of external elements Aum(A, m2)			171.4072					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.8141			(33)
Main dwelling								
Party Wall 1			81.2200	0.0000	0.0000	20.0000	1624.4000	(32)
Timber			96.4800			9.0000	868.3200	(32c)
FF			41.1800			18.0000	741.2400	(32d)
GF			41.1800			9.0000	370.6200	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 7845.8748 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 86.2563 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	8.6300	0.1150	0.9925
E3 Sill	8.6300	0.0170	0.1467
E4 Jamb	28.2000	0.0940	2.6508
E5 Ground floor (normal)	16.6400	0.0670	1.1149
E16 Corner (normal)	4.9600	0.0680	0.3373
E12 Gable (insulation at ceiling level)	11.0000	0.0770	0.8470
E6 Intermediate floor within a dwelling	11.0000	0.0320	0.3520
E17 Corner (inverted - internal area greater than external area)	4.9600	-0.0290	-0.1438
P1 Party wall - Ground floor	12.4600	0.3200	3.9872
E20 Exposed floor (normal)	6.4400	0.0790	0.5088
E21 Exposed floor (inverted)	12.0800	0.0630	0.7610
E18 Party wall between dwellings	11.1200	0.0920	1.0230
P4 Party wall - Roof (insulation at ceiling level)	18.1000	0.1020	1.8462
E25 Staggered party wall between dwellings	9.9200	0.0560	0.5555

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 14.9790 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 44.7932 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	29.0444	28.6228	28.2011	26.0928	25.6712	23.5629	23.5629	23.1413	24.4062	25.6712	26.5145	27.3578	(38)

Heat transfer coeff

	73.8376	73.4159	72.9943	70.8860	70.4644	68.3561	68.3561	67.9345	69.1994	70.4644	71.3077	72.1510	(39)

Average = Sum(39)m / 12 = 70.7806

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8118	0.8071	0.8025	0.7793	0.7747	0.7515	0.7515	0.7469	0.7608	0.7747	0.7839	0.7932	(40)
HLP (average)												0.7782	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6386 (42)
Hot water usage for mixer showers

68.4610	67.4321	65.9329	63.0644	60.9476	58.5869	57.2450	58.7329	60.3639	62.8986	65.8287	68.1987	(42a)

Hot water usage for baths

29.5637	29.1246	28.5063	27.3663	26.5127	25.5661	25.0549	25.6688	26.3373	27.3502	28.5137	29.4637	(42b)

Hot water usage for other uses

41.6522	40.1376	38.6230	37.1084	35.5937	34.0791	34.0791	35.5937	37.1084	38.6230	40.1376	41.6522	(42c)

Average daily hot water use (litres/day) 128.3946 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	139.6769	136.6944	133.0622	127.5391	123.0540	118.2321	116.3790	119.9955	123.8096	128.8717	134.4799	139.3147	(44)
Energy conte	221.2141	194.6510	204.5117	174.5947	165.6543	145.3802	140.7503	148.5795	152.6696	174.8777	191.5913	218.1331	(45)

Energy content (annual) Total = Sum(45)m = 2132.6075
Distribution loss (46)m = 0.15 x (45)m

33.1821	29.1976	30.6768	26.1892	24.8482	21.8070	21.1126	22.2869	22.9004	26.2317	28.7387	32.7200	(46)

Water storage loss:
Store volume 210.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.5800 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.8532 (55)
Total storage loss

26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(56)

If cylinder contains dedicated solar storage

26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

270.9257	239.5518	254.2233	222.7027	215.3659	193.4882	190.4619	198.2911	200.7776	224.5893	239.6993	267.8447	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

270.9257	239.5518	254.2233	222.7027	215.3659	193.4882	190.4619	198.2911	200.7776	224.5893	239.6993	267.8447	(64)

Total per year (kWh/year) = Sum(64)m = 2717.9215 (64)
12Total per year (kWh/year) 2718 (64)
Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)
Heat gains from water heating, kWh/month

113.3230	100.6421	107.7694	96.5391	94.8493	86.8253	86.5688	89.1720	89.2490	97.9161	102.1905	112.2985	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

145.9975	161.6401	145.9975	150.8641	145.9975	150.8641	145.9975	145.9975	150.8641	145.9975	150.8641	145.9975	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

240.8328	243.3319	237.0343	223.6274	206.7036	190.7976	180.1714	177.6723	183.9699	197.3768	214.3007	230.2066	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	(71)

Water heating gains (Table 5)

152.3158	149.7650	144.8514	134.0821	127.4857	120.5907	116.3559	119.8548	123.9570	131.6077	141.9313	150.9389	(72)

Total internal gains

601.7256	617.3165	590.4626	571.1531	542.7662	524.8319	505.1042	506.1041	521.3705	537.5615	569.6755	589.7225	(73)

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6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains

		m2	Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	factor Table 6d	W	
East		4.9800	19.6403	0.3000	0.0000	0.7700	22.5938	(76)
West		3.5300	19.6403	0.3000	0.0000	0.7700	16.0153	(80)

Solar gains	38.6090	75.5274	124.3829	181.4051	222.3188	227.5828	216.6681	186.1147	144.6625	89.6197	48.1409	31.7502	(83)
Total gains	640.3346	692.8439	714.8456	752.5582	765.0850	752.4147	721.7724	692.2188	666.0330	627.1812	617.8164	621.4727	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	29.5163	29.6858	29.8573	30.7453	30.9292	31.8832	31.8832	32.0811	31.4946	30.9292	30.5635	30.2062	
alpha	2.9678	2.9791	2.9905	3.0497	3.0619	3.1255	3.1255	3.1387	3.0996	3.0619	3.0376	3.0137	
util living area	0.9257	0.9043	0.8731	0.7999	0.6927	0.5314	0.4005	0.4303	0.6197	0.8090	0.8948	0.9301	(86)
Living	19.2059	19.4405	19.7783	20.2732	20.6431	20.8917	20.9664	20.9577	20.8146	20.3581	19.7568	19.2090	
Non living	18.5914	18.8234	19.1557	19.6451	19.9905	20.2218	20.2776	20.2761	20.1543	19.7347	19.1505	18.6062	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.0822	19.4405	19.7783	20.2732	20.6431	20.8917	20.9664	20.9577	20.8146	20.3581	19.7568	19.4595	(87)
Th 2	20.2432	20.2472	20.2512	20.2713	20.2753	20.2956	20.2956	20.2996	20.2875	20.2753	20.2673	20.2592	(88)
util rest of house	0.9178	0.8943	0.8594	0.7783	0.6591	0.4833	0.3413	0.3709	0.5731	0.7843	0.8824	0.9227	(89)
MIT 2	19.3982	18.8234	19.1557	19.6451	19.9905	20.2218	20.2776	20.2761	20.1543	19.7347	19.1505	18.8374	(90)
Living area fraction									fLA = Living area / (4) =			0.3196	(91)
MIT	19.6168	19.0206	19.3547	19.8458	20.1991	20.4359	20.4977	20.4939	20.3653	19.9339	19.3443	19.0362	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6168	19.0206	19.3547	19.8458	20.1991	20.4359	20.4977	20.4939	20.3653	19.9339	19.3443	19.0362	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9104	0.8750	0.8406	0.7644	0.6553	0.4932	0.3586	0.3877	0.5784	0.7714	0.8641	0.9082	(94)
Useful gains	582.9793	606.2386	600.8828	575.2925	501.3654	371.0947	258.8479	268.3853	385.2521	483.8220	533.8636	564.4085	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1130.9558	1036.6772	938.3184	775.9072	598.8824	398.9171	266.4323	278.1170	433.5571	657.7081	873.1091	1070.4479	(97)
Space heating kWh	407.6946	289.2547	251.0521	144.4425	72.5527	0.0000	0.0000	0.0000	0.0000	129.3713	244.2568	376.4933	(98a)
Space heating requirement - total per year (kWh/year)												1915.1180	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	407.6946	289.2547	251.0521	144.4425	72.5527	0.0000	0.0000	0.0000	0.0000	129.3713	244.2568	376.4933	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1915.1180	
Space heating per m2											(98c) / (4) =	21.0545	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Efficiency of main space heating system 1 (in %)	270.8847 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	407.6946	289.2547	251.0521	144.4425	72.5527	0.0000	0.0000	0.0000	0.0000	129.3713	244.2568	376.4933	(98)
Space heating efficiency (main heating system 1)	270.8847	270.8847	270.8847	270.8847	0.0000	0.0000	0.0000	0.0000	270.8847	270.8847	270.8847	270.8847	(210)
Space heating fuel (main heating system)	150.5048	106.7815	92.6786	53.3225	26.7836	0.0000	0.0000	0.0000	0.0000	47.7588	90.1700	138.9866	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	270.9257	239.5518	254.2233	222.7027	215.3659	193.4882	190.4619	198.2911	200.7776	224.5893	239.6993	267.8447	(64)
Efficiency of water heater												281.0493	(216)
(217)m	281.0493	281.0493	281.0493	281.0493	281.0493	281.0493	281.0493	281.0493	281.0493	281.0493	281.0493	281.0493	(217)
Fuel for water heating, kWh/month	96.3979	85.2348	90.4551	79.2397	76.6292	68.8449	67.7682	70.5539	71.4386	79.9110	85.2873	95.3017	(219)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	29.6563	26.7864	29.6563	28.6997	29.6563	28.6997	29.6563	29.6563	28.6997	29.6563	28.6997	29.6563	(231)
Lighting	30.8703	24.7653	22.2984	16.3368	12.6190	10.3098	11.5115	14.9631	19.4355	25.5005	28.8027	31.7283	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	706.9864	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	281.0493	
Water heating fuel used	967.0623	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.1900)		
mechanical ventilation fans (SFP = 1.1900)	349.1794	(230a)
Total electricity for the above, kWh/year	349.1794	(231)
Electricity for lighting (calculated in Appendix L)	249.1413	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2272.3695	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	706.9864	0.1552	109.7234	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	967.0623	0.1410	136.3181	(264)
Space and water heating			246.0414	(265)
Pumps, fans and electric keep-hot	349.1794	0.1387	48.4355	(267)
Energy for lighting	249.1413	0.1443	35.9588	(268)
Total CO2, kg/year			330.4357	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.6300	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	706.9864	1.5746	1113.1910	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	967.0623	1.5212	1471.1200	(278)
Space and water heating			2584.3110	(279)
Pumps, fans and electric keep-hot	349.1794	1.5128	528.2386	(281)
Energy for lighting	249.1413	1.5338	382.1413	(282)
Total Primary energy kWh/year			3494.6909	(286)
Dwelling Primary energy Rate (DPER)			38.4200	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	41.1800	(1b)	x 2.4800	(2b) =	102.1264	(1b) - (3b)
First floor	49.7800	(1c)	x 2.7800	(2c) =	138.3884	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	90.9600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		240.5148	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1247	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3747	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3185	(21)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4061	0.3982	0.3902	0.3504	0.3424	0.3026	0.3026	0.2946	0.3185	0.3424	0.3583	0.3743 (22b)
Effective ac	0.5825	0.5793	0.5761	0.5614	0.5586	0.5458	0.5458	0.5434	0.5507	0.5586	0.5642	0.5700 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			4.1400	1.0000	4.1400			(26)
TER Opening Type			8.5100	1.1450	9.7443			(27)
GF			41.1800	0.1300	5.3534			(28a)
Exposed Floor			8.6000	0.1300	1.1180			(28b)
Main	71.8472	12.6500	59.1972	0.1800	10.6555			(29a)
PIJ	49.7800		49.7800	0.1100	5.4758			(30)
Total net area of external elements Aum(A, m2)			171.4072					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	36.4870			(33)
Main dwelling								
Party Wall 1			81.2200	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 86.2563 (35)

List of Thermal Bridges

	Length	Psi-value	Total	
K1 Element				
E2 Other lintels (including other steel lintels)	8.6300	0.0500	0.4315	
E3 Sill	8.6300	0.0500	0.4315	
E4 Jamb	28.2000	0.0500	1.4100	
E5 Ground floor (normal)	16.6400	0.1600	2.6624	
E16 Corner (normal)	4.9600	0.0900	0.4464	
E12 Gable (insulation at ceiling level)	11.0000	0.0600	0.6600	
E6 Intermediate floor within a dwelling	11.0000	0.0000	0.0000	
E17 Corner (inverted - internal area greater than external area)	4.9600	-0.0900	-0.4464	
P1 Party wall - Ground floor	12.4600	0.0800	0.9968	
E20 Exposed floor (normal)	6.4400	0.3200	2.0608	
E21 Exposed floor (inverted)	12.0800	0.3200	3.8656	
E18 Party wall between dwellings	11.1200	0.0600	0.6672	
P4 Party wall - Roof (insulation at ceiling level)	18.1000	0.1200	2.1720	
E25 Staggered party wall between dwellings	9.9200	0.0600	0.5952	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 15.9530 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 52.4400 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	46.2302	45.9760	45.7269	44.5568	44.3378	43.3187	43.3187	43.1299	43.7112	44.3378	44.7807	45.2438	(38)
Heat transfer coeff	98.6702	98.4160	98.1669	96.9967	96.7778	95.7586	95.7586	95.5699	96.1512	96.7778	97.2207	97.6837	(39)
Average = Sum(39)m / 12 =												96.9957	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0848	1.0820	1.0792	1.0664	1.0640	1.0528	1.0528	1.0507	1.0571	1.0640	1.0688	1.0739	(40)
HLP (average)												1.0664	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6386 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	68.4610	67.4321	65.9329	63.0644	60.9476	58.5869	57.2450	58.7329	60.3639	62.8986	65.8287	68.1987	(42a)
Hot water usage for baths	29.5637	29.1246	28.5063	27.3663	26.5127	25.5661	25.0549	25.6688	26.3373	27.3502	28.5137	29.4637	(42b)
Hot water usage for other uses	41.6522	40.1376	38.6230	37.1084	35.5937	34.0791	34.0791	35.5937	37.1084	38.6230	40.1376	41.6522	(42c)
Average daily hot water use (litres/day)												128.3946	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	139.6769	136.6944	133.0622	127.5391	123.0540	118.2321	116.3790	119.9955	123.8096	128.8717	134.4799	139.3147	(44)
Energy conte	221.2141	194.6510	204.5117	174.5947	165.6543	145.3802	140.7503	148.5795	152.6696	174.8777	191.5913	218.1331	(45)
Energy content (annual)										Total = Sum(45)m =		2132.6075	
Distribution loss (46)m = 0.15 x (45)m	33.1821	29.1976	30.6768	26.1892	24.8482	21.8070	21.1126	22.2869	22.9004	26.2317	28.7387	32.7200	(46)
Water storage loss:													
Store volume												210.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7016	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.9188	(55)
Total storage loss	28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842	(56)
If cylinder contains dedicated solar storage	28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	272.9607	241.3898	256.2583	224.6720	217.4009	195.4575	192.4969	200.3261	202.7469	226.6243	241.6687	269.8797	(62)
WWHRS	-31.2975	-27.6798	-28.9847	-24.0004	-22.3675	-19.1401	-17.9408	-19.0782	-19.8031	-23.3456	-26.4477	-30.7179	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	241.6632	213.7101	227.2737	200.6716	195.0334	176.3175	174.5562	181.2479	182.9439	203.2787	215.2209	239.1618	(64)
										Total per year (kWh/year) = Sum(64)m =		2451.0786	(64)
12Total per year (kWh/year)												2451	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	114.9510	102.1125	109.3974	98.1146	96.4773	88.4008	88.1968	90.7999	90.8245	99.5441	103.7660	113.9265	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	142.2156	157.4530	142.2156	146.9561	142.2156	146.9561	142.2156	142.2156	146.9561	142.2156	146.9561	142.2156	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	240.8328	243.3319	237.0343	223.6274	206.7036	190.7976	180.1714	177.6723	183.9699	197.3768	214.3007	230.2066	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	(71)

Water heating gains (Table 5)

	154.5040	151.9532	147.0395	136.2703	129.6738	122.7789	118.5440	122.0429	126.1452	133.7959	144.1194	153.1270	(72)

Total internal gains

	603.1319	618.3176	591.8689	572.4333	544.1725	523.1121	503.5105	504.5103	519.6507	538.9678	570.9557	591.1288	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	4.9800	19.6403	0.6300	0.7000	0.7700	29.8916	(76)
West	3.5300	19.6403	0.6300	0.7000	0.7700	21.1882	(80)

Solar gains	51.0797	99.9228	164.5586	239.9990	294.1277	301.0921	286.6519	246.2298	191.3885	118.5668	63.6904	42.0055	(83)
Total gains	654.2116	718.2404	756.4276	812.4323	838.3003	824.2042	790.1625	750.7401	711.0392	657.5346	634.6461	633.1343	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	22.0878	22.1449	22.2011	22.4689	22.5197	22.7594	22.7594	22.8043	22.6665	22.5197	22.4171	22.3109	
alpha	2.4725	2.4763	2.4801	2.4979	2.5013	2.5173	2.5173	2.5203	2.5111	2.5013	2.4945	2.4874	
util living area	0.9360	0.9177	0.8901	0.8304	0.7393	0.6039	0.4758	0.5113	0.6900	0.8457	0.9133	0.9404	(86)
MIT	18.4055	18.6788	19.1165	19.7406	20.2920	20.7078	20.8849	20.8584	20.5623	19.8623	19.0543	18.3688	(87)
Th 2	20.0133	20.0156	20.0178	20.0284	20.0304	20.0396	20.0396	20.0413	20.0360	20.0304	20.0264	20.0222	(88)
util rest of house	0.9279	0.9074	0.8758	0.8069	0.7003	0.5405	0.3887	0.4252	0.6331	0.8197	0.9008	0.9329	(89)
MIT 2	16.9801	17.3251	17.8765	18.6558	19.3201	19.7941	19.9672	19.9474	19.6441	18.8191	17.8103	16.9389	(90)
Living area fraction									fLA = Living area / (4) =			0.3196	(91)
MIT	17.4357	17.7577	18.2728	19.0025	19.6307	20.0861	20.2605	20.2386	19.9375	19.1525	18.2078	17.3959	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.4357	17.7577	18.2728	19.0025	19.6307	20.0861	20.2605	20.2386	19.9375	19.1525	18.2078	17.3959	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8993	0.8764	0.8434	0.7775	0.6822	0.5438	0.4098	0.4440	0.6266	0.7911	0.8703	0.9053	(94)
Useful gains	588.3189	629.4443	637.9923	631.6314	571.9223	448.2148	323.7839	333.2941	445.5711	520.1449	552.3117	573.1478	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1296.0984	1265.4063	1155.6998	979.9051	767.5179	525.3461	350.5219	366.8520	561.2863	827.6930	1079.9121	1289.0229	(97)
Space heating kWh	526.5880	427.3664	385.1743	250.7571	145.5232	0.0000	0.0000	0.0000	0.0000	228.8158	379.8723	532.6111	(98a)
Space heating requirement - total per year (kWh/year)												2876.7082	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	526.5880	427.3664	385.1743	250.7571	145.5232	0.0000	0.0000	0.0000	228.8158	379.8723	532.6111	(98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												2876.7082	
Space heating per m2											(98c) / (4) =	31.6261	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	526.5880	427.3664	385.1743	250.7571	145.5232	0.0000	0.0000	0.0000	0.0000	228.8158	379.8723	532.6111	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	570.5179	463.0189	417.3070	271.6761	157.6632	0.0000	0.0000	0.0000	0.0000	247.9044	411.5627	577.0434	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	241.6632	213.7101	227.2737	200.6716	195.0334	176.3175	174.5562	181.2479	182.9439	203.2787	215.2209	239.1618	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.7576	85.5823	85.2328	84.5606	83.4125	79.8000	79.8000	79.8000	79.8000	84.3258	85.3199	85.8013	(217)
Fuel for water heating, kWh/month	281.7980	249.7128	266.6504	237.3110	233.8180	220.9492	218.7421	227.1276	229.2530	241.0634	252.2517	278.7391	(219)

Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	29.5496	23.7058	21.3444	15.6378	12.0791	9.8687	11.0190	14.3229	18.6040	24.4095	27.5704	30.3709	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-38.9812	-55.1702	-79.5760	-89.7571	-96.9883	-90.5718	-89.4598	-84.3870	-75.4216	-63.2498	-42.9366	-33.6769	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-21.3144	-44.9402	-89.5251	-134.7575	-178.4789	-179.4591	-177.3409	-150.0006	-109.7478	-64.3537	-28.4842	-16.8460	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	3116.6936	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2937.4164	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	238.4821	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-2035.4247	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	4343.1674	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3116.6936	0.2100	654.5057	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2937.4164	0.2100	616.8574	(264)
Space and water heating			1271.3631	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	238.4821	0.1443	34.4203	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-840.1762	0.1345	-113.0202	
PV Unit electricity exported	-1195.2485	0.1258	-150.3985	
Total			-263.4187	(269)
Total CO2, kg/year			1054.2940	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.5900	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	3116.6936	1.1300	3521.8638	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2937.4164	1.1300	3319.2805	(278)
Space and water heating			6841.1443	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	238.4821	1.5338	365.7919	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-840.1762	1.4972	-1257.8767	
PV Unit electricity exported	-1195.2485	0.4619	-552.0620	
Total			-1809.9387	(283)
Total Primary energy kWh/year			5527.0983	(286)
Target Primary Energy Rate (TPER)			60.7600	(287)

Full SAP Calculation Printout

Property Reference	78449-10	**Issued on Date**	03/10/2025
Assessment Reference	001	**Prop Type Ref**	Mid
Property	836 Rochdale Road, MANCHESTER, M9 8FA		

SAP Rating	84 B	**DER**	3.63	**TER**	11.59
Environmental	97 A	**% DER < TER**			68.68
CO_2 Emissions (t/year)	0.32	**DFEE**	34.22	**TFEE**	37.64
Compliance Check	See BREL	**% DFEE < TFEE**			9.08
% DPER < TPER	36.77	**DPER**	38.42	**TPER**	60.76

Assessor Details	Mr. Daniel Goddard	**Assessor ID**	CP52-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	41.1800 (1b)	x	2.4800 (2b)	=	102.1264	(1b) - (3b)
First floor	49.7800 (1c)	x	2.7800 (2c)	=	138.3884	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	90.9600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	240.5148	(5)

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2. Ventilation rate

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				m3 per hour	
Number of open chimneys			0 * 80 =	0.0000	(6a)
Number of open flues			0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire			0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler			0 * 20 =	0.0000	(6d)
Number of flues attached to other heater			0 * 35 =	0.0000	(6e)
Number of blocked chimneys			0 * 20 =	0.0000	(6f)
Number of intermittent extract fans			0 * 10 =	0.0000	(7a)
Number of passive vents			0 * 10 =	0.0000	(7b)
Number of flueless gas fires			0 * 40 =	0.0000	(7c)
				Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =			0.0000 / (5) =	0.0000	(8)
Pressure test				Yes	
Pressure Test Method				Blower Door	
Measured/design AP50				5.0000	(17)
Infiltration rate				0.2500	(18)
Number of sides sheltered				2	(19)
Shelter factor			(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =	0.2125	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2709	0.2656	0.2603	0.2338	0.2284	0.2019	0.2019	0.1966	0.2125	0.2284	0.2391	0.2497	(22b)

Balanced mechanical ventilation with heat recovery		
If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =		81.0000 (23c)

Effective ac	0.3659	0.3606	0.3553	0.3287	0.3234	0.2969	0.2969	0.2916	0.3075	0.3234	0.3341	0.3447	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door			4.1400	1.0000	4.1400			(26)
Window			8.5100	0.7752	6.5969			(27)
GF			41.1800	0.0900	3.7062	75.0000	3088.5000	(28a)
Exposed Floor			8.6000	0.1400	1.2040	20.0000	172.0000	(28b)
Main	71.8472	12.6500	59.1972	0.1300	7.6956	9.0000	532.7748	(29a)
PIJ	49.7800		49.7800	0.1300	6.4714	9.0000	448.0200	(30)
Total net area of external elements Aum(A, m2)			171.4072					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.8141			(33)
Main dwelling								
Party Wall 1			81.2200	0.0000	0.0000	20.0000	1624.4000	(32)
Timber			96.4800			9.0000	868.3200	(32c)
FF			41.1800			18.0000	741.2400	(32d)
GF			41.1800			9.0000	370.6200	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 7845.8748 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 86.2563 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	8.6300	0.1150	0.9925
E3 Sill	8.6300	0.0170	0.1467
E4 Jamb	28.2000	0.0940	2.6508
E5 Ground floor (normal)	16.6400	0.0670	1.1149
E16 Corner (normal)	4.9600	0.0680	0.3373
E12 Gable (insulation at ceiling level)	11.0000	0.0770	0.8470
E6 Intermediate floor within a dwelling	11.0000	0.0320	0.3520
E17 Corner (inverted - internal area greater than external area)	4.9600	-0.0290	-0.1438
P1 Party wall - Ground floor	12.4600	0.3200	3.9872
E20 Exposed floor (normal)	6.4400	0.0790	0.5088
E21 Exposed floor (inverted)	12.0800	0.0630	0.7610
E18 Party wall between dwellings	11.1200	0.0920	1.0230
P4 Party wall - Roof (insulation at ceiling level)	18.1000	0.1020	1.8462
E25 Staggered party wall between dwellings	9.9200	0.0560	0.5555

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 14.9790 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 44.7932 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	29.0444	28.6228	28.2011	26.0928	25.6712	23.5629	23.5629	23.1413	24.4062	25.6712	26.5145	27.3578	(38)
Heat transfer coeff	73.8376	73.4159	72.9943	70.8860	70.4644	68.3561	68.3561	67.9345	69.1994	70.4644	71.3077	72.1510	(39)
Average = Sum(39)m / 12 =												70.7806	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8118	0.8071	0.8025	0.7793	0.7747	0.7515	0.7515	0.7469	0.7608	0.7747	0.7839	0.7932	(40)
HLP (average)												0.7782	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6386 (42)
Hot water usage for mixer showers

68.4610	67.4321	65.9329	63.0644	60.9476	58.5869	57.2450	58.7329	60.3639	62.8986	65.8287	68.1987	(42a)

Hot water usage for baths

29.5637	29.1246	28.5063	27.3663	26.5127	25.5661	25.0549	25.6688	26.3373	27.3502	28.5137	29.4637	(42b)

Hot water usage for other uses

41.6522	40.1376	38.6230	37.1084	35.5937	34.0791	34.0791	35.5937	37.1084	38.6230	40.1376	41.6522	(42c)

Average daily hot water use (litres/day) 128.3946 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	139.6769	136.6944	133.0622	127.5391	123.0540	118.2321	116.3790	119.9955	123.8096	128.8717	134.4799	139.3147	(44)
Energy conte	221.2141	194.6510	204.5117	174.5947	165.6543	145.3802	140.7503	148.5795	152.6696	174.8777	191.5913	218.1331	(45)
Energy content (annual)										Total = Sum(45)m =		2132.6075	
Distribution loss (46)m = 0.15 x (45)m	33.1821	29.1976	30.6768	26.1892	24.8482	21.8070	21.1126	22.2869	22.9004	26.2317	28.7387	32.7200	(46)
Water storage loss:													
Store volume												210.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5800	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8532	(55)
Total storage loss	26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(56)
If cylinder contains dedicated solar storage	26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	270.9257	239.5518	254.2233	222.7027	215.3659	193.4882	190.4619	198.2911	200.7776	224.5893	239.6993	267.8447	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	270.9257	239.5518	254.2233	222.7027	215.3659	193.4882	190.4619	198.2911	200.7776	224.5893	239.6993	267.8447	(64)
										Total per year (kWh/year) = Sum(64)m =		2717.9215	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	113.3230	100.6421	107.7694	96.5391	94.8493	86.8253	86.5688	89.1720	89.2490	97.9161	102.1905	112.2985	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	35.2685	31.3252	25.4754	19.2865	14.4169	12.1713	13.1516	17.0949	22.9447	29.1336	34.0032	36.2488	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	359.4520	363.1820	353.7825	333.7722	308.5128	284.7725	268.9125	265.1825	274.5820	294.5923	319.8517	343.5920	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	(71)
Water heating gains (Table 5)	152.3158	149.7650	144.8514	134.0821	127.4857	120.5907	116.3559	119.8548	123.9570	131.6077	141.9313	150.9389	(72)
Total internal gains	653.2794	650.5153	630.3524	593.3839	556.6585	523.7777	504.6631	508.3753	527.7268	561.5767	602.0293	637.0228	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a	g Specific data	FF Specific data	Access factor	Gains W

					W/m2	or Table 6b		or Table 6c		Table 6d			
East					4.9800	19.6403		0.3000		0.0000	0.7700	22.5938	(76)
West					3.5300	19.6403		0.3000		0.0000	0.7700	16.0153	(80)
Solar gains	38.6090	75.5274	124.3829	181.4051	222.3188	227.5828	216.6681	186.1147	144.6625	89.6197	48.1409	31.7502	(83)
Total gains	691.8885	726.0427	754.7353	774.7891	778.9772	751.3605	721.3312	694.4900	672.3893	651.1964	650.1702	668.7729	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	29.5163	29.6858	29.8573	30.7453	30.9292	31.8832	31.8832	32.0811	31.4946	30.9292	30.5635	30.2062	
alpha	2.9678	2.9791	2.9905	3.0497	3.0619	3.1255	3.1255	3.1387	3.0996	3.0619	3.0376	3.0137	
util living area	0.9121	0.8945	0.8591	0.7899	0.6853	0.5320	0.4007	0.4290	0.6157	0.7964	0.8831	0.9178	(86)
Living	19.3133	19.5049	19.8465	20.3018	20.6541	20.8914	20.9663	20.9580	20.8180	20.3899	19.8174	19.3099	
Non living	18.6955	18.8852	19.2202	19.6711	19.9998	20.2215	20.2775	20.2763	20.1570	19.7633	19.2082	18.7041	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.1371	19.5049	19.8465	20.3018	20.6541	20.8914	20.9663	20.9580	20.8180	20.3899	19.8174	19.5463	(87)
Th 2	20.2432	20.2472	20.2512	20.2713	20.2753	20.2956	20.2956	20.2996	20.2875	20.2753	20.2673	20.2592	(88)
util rest of house	0.9031	0.8837	0.8444	0.7678	0.6515	0.4839	0.3415	0.3698	0.5690	0.7708	0.8697	0.9093	(89)
MIT 2	19.4514	18.8852	19.2202	19.6711	19.9998	20.2215	20.2775	20.2763	20.1570	19.7633	19.2082	18.9216	(90)
Living area fraction									fLA = Living area / (4) =			0.3196	(91)
MIT	19.6706	19.0833	19.4203	19.8726	20.2089	20.4356	20.4977	20.4941	20.3682	19.9636	19.4029	19.1213	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6706	19.0833	19.4203	19.8726	20.2089	20.4356	20.4977	20.4941	20.3682	19.9636	19.4029	19.1213	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8955	0.8643	0.8258	0.7545	0.6482	0.4938	0.3588	0.3866	0.5746	0.7587	0.8515	0.8941	(94)
Useful gains	619.5576	627.4984	623.2848	584.6008	504.9435	370.9896	258.8336	268.4813	386.3351	494.0863	553.6206	597.9674	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1134.9258	1041.2778	943.1111	777.8068	599.5755	398.8983	266.4298	278.1337	433.7576	659.7981	877.2884	1076.5852	(97)
Space heating kWh	383.4339	278.0598	237.9508	139.1083	70.4062	0.0000	0.0000	0.0000	0.0000	123.2896	233.0408	356.0916	(98a)
Space heating requirement - total per year (kWh/year)												1821.3810	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	383.4339	278.0598	237.9508	139.1083	70.4062	0.0000	0.0000	0.0000	0.0000	123.2896	233.0408	356.0916	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1821.3810	
Space heating per m2										(98c) / (4) =		20.0240	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	270.8847	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	383.4339	278.0598	237.9508	139.1083	70.4062	0.0000	0.0000	0.0000	0.0000	123.2896	233.0408	356.0916	(98)
Space heating efficiency (main heating system 1)	270.8847	270.8847	270.8847	270.8847	270.8847	0.0000	0.0000	0.0000	0.0000	270.8847	270.8847	270.8847	(210)
Space heating fuel (main heating system)	141.5488	102.6488	87.8421	51.3533	25.9912	0.0000	0.0000	0.0000	0.0000	45.5137	86.0295	131.4551	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	270.9257	239.5518	254.2233	222.7027	215.3659	193.4882	190.4619	198.2911	200.7776	224.5893	239.6993	267.8447	(64)
Efficiency of water heater												281.0493	(216)
(217)m	281.0493	281.0493	281.0493	281.0493	281.0493	281.0493	281.0493	281.0493	281.0493	281.0493	281.0493	281.0493	(217)
Fuel for water heating, kWh/month	96.3979	85.2348	90.4551	79.2397	76.6292	68.8449	67.7682	70.5539	71.4386	79.9110	85.2873	95.3017	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	29.6563	26.7864	29.6563	28.6997	29.6563	28.6997	29.6563	29.6563	28.6997	29.6563	28.6997	29.6563	(231)
Lighting	30.8703	24.7653	22.2984	16.3368	12.6190	10.3098	11.5115	14.9631	19.4355	25.5005	28.8027	31.7283	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	672.3824	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	281.0493	
Water heating fuel used	967.0623	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.1900)		
mechanical ventilation fans (SFP = 1.1900)	349.1794	(230a)
Total electricity for the above, kWh/year	349.1794	(231)
Electricity for lighting (calculated in Appendix L)	249.1413	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2237.7655	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	672.3824	16.4900	110.8759	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	967.0623	16.4900	159.4686	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	349.1794	16.4900	57.5797	(249)
Energy for lighting	249.1413	16.4900	41.0834	(250)
Additional standing charges			0.0000	(251)
Total energy cost			369.0075	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.9771	(257)
SAP value		84.1617	
SAP rating (Section 12)		84	(258)
SAP band		B	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	672.3824	0.1551	104.3180	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	967.0623	0.1410	136.3181	(264)
Space and water heating			240.6360	(265)
Pumps, fans and electric keep-hot	349.1794	0.1387	48.4355	(267)
Energy for lighting	249.1413	0.1443	35.9588	(268)
Total CO2, kg/year			325.0303	(272)
CO2 emissions per m2			3.5700	(273)
EI value			96.7966	
EI rating			97	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	41.1800 (1b)	x	2.4800 (2b)	=	102.1264	(1b) - (3b)
First floor	49.7800 (1c)	x	2.7800 (2c)	=	138.3884	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 90.9600						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	240.5148	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.2500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2125	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.6000	4.5000	4.5000	4.1000	4.2000	3.7000	3.5000	3.5000	3.7000	4.1000	4.1000	4.2000	(22)
Wind factor	1.1500	1.1250	1.1250	1.0250	1.0500	0.9250	0.8750	0.8750	0.9250	1.0250	1.0250	1.0500	(22a)
Adj infilt rate													
	0.2444	0.2391	0.2391	0.2178	0.2231	0.1966	0.1859	0.1859	0.1966	0.2178	0.2178	0.2231	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	81.0000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.3394	0.3341	0.3341	0.3128	0.3181	0.2916	0.2809	0.2809	0.2916	0.3128	0.3128	0.3181	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Door			4.1400	1.0000	4.1400			(26)
Window			8.5100	0.7752	6.5969			(27)
GF			41.1800	0.0900	3.7062	75.0000	3088.5000	(28a)
Exposed Floor			8.6000	0.1400	1.2040	20.0000	172.0000	(28b)
Main	71.8472	12.6500	59.1972	0.1300	7.6956	9.0000	532.7748	(29a)
PIJ	49.7800		49.7800	0.1300	6.4714	9.0000	448.0200	(30)
Total net area of external elements Aum(A, m2)			171.4072					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.8141			(33)
Main dwelling								
Party Wall 1			81.2200	0.0000	0.0000	20.0000	1624.4000	(32)
Timber			96.4800			9.0000	868.3200	(32c)
FF			41.1800			18.0000	741.2400	(32d)
GF			41.1800			9.0000	370.6200	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	7845.8748 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		86.2563 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	8.6300	0.1150	0.9925
E3 Sill	8.6300	0.0170	0.1467
E4 Jamb	28.2000	0.0940	2.6508
E5 Ground floor (normal)	16.6400	0.0670	1.1149
E16 Corner (normal)	4.9600	0.0680	0.3373
E12 Gable (insulation at ceiling level)	11.0000	0.0770	0.8470
E6 Intermediate floor within a dwelling	11.0000	0.0320	0.3520
E17 Corner (inverted - internal area greater than external area)	4.9600	-0.0290	-0.1438
P1 Party wall - Ground floor	12.4600	0.3200	3.9872
E20 Exposed floor (normal)	6.4400	0.0790	0.5088
E21 Exposed floor (inverted)	12.0800	0.0630	0.7610
E18 Party wall between dwellings	11.1200	0.0920	1.0230
P4 Party wall - Roof (insulation at ceiling level)	18.1000	0.1020	1.8462
E25 Staggered party wall between dwellings	9.9200	0.0560	0.5555

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		14.9790 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	44.7932 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	26.9362	26.5145	26.5145	24.8279	25.2495	23.1413	22.2980	22.2980	23.1413	24.8279	24.8279	25.2495	(38)
Heat transfer coeff													
	71.7293	71.3077	71.3077	69.6211	70.0427	67.9345	67.0912	67.0912	67.9345	69.6211	69.6211	70.0427	(39)
Average = Sum(39)m / 12 =												69.4454	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7886	0.7839	0.7839	0.7654	0.7700	0.7469	0.7376	0.7376	0.7469	0.7654	0.7654	0.7700	(40)
HLP (average)												0.7635	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.6386	(42)

Hot water usage for mixer showers

68.4610	67.4321	65.9329	63.0644	60.9476	58.5869	57.2450	58.7329	60.3639	62.8986	65.8287	68.1987	(42a)

Hot water usage for baths

29.5637	29.1246	28.5063	27.3663	26.5127	25.5661	25.0549	25.6688	26.3373	27.3502	28.5137	29.4637	(42b)

Hot water usage for other uses

41.6522	40.1376	38.6230	37.1084	35.5937	34.0791	34.0791	35.5937	37.1084	38.6230	40.1376	41.6522	(42c)

Average daily hot water use (litres/day)	128.3946	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	139.6769	136.6944	133.0622	127.5391	123.0540	118.2321	116.3790	119.9955	123.8096	128.8717	134.4799	139.3147	(44)
Energy conte	221.2141	194.6510	204.5117	174.5947	165.6543	145.3802	140.7503	148.5795	152.6696	174.8777	191.5913	218.1331	(45)
Energy content (annual)										Total = Sum(45)m =		2132.6075	
Distribution loss (46)m = 0.15 x (45)m													
	33.1821	29.1976	30.6768	26.1892	24.8482	21.8070	21.1126	22.2869	22.9004	26.2317	28.7387	32.7200	(46)

Water storage loss:		
Store volume	210.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):	1.5800	(48)
Temperature factor from Table 2b	0.5400	(49)
Enter (49) or (54) in (55)	0.8532	(55)

Total storage loss

26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(56)

If cylinder contains dedicated solar storage

26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(57)

Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	270.9257	239.5518	254.2233	222.7027	215.3659	193.4882	190.4619	198.2911	200.7776	224.5893	239.6993	267.8447	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	270.9257	239.5518	254.2233	222.7027	215.3659	193.4882	190.4619	198.2911	200.7776	224.5893	239.6993	267.8447	(64)
										Total per year (kWh/year) = Sum(64)m =		2717.9215	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	113.3230	100.6421	107.7694	96.5391	94.8493	86.8253	86.5688	89.1720	89.2490	97.9161	102.1905	112.2985	(65)

5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	35.2685	31.3252	25.4754	19.2865	14.4169	12.1713	13.1516	17.0949	22.9447	29.1336	34.0032	36.2488	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	359.4520	363.1820	353.7825	333.7722	308.5128	284.7725	268.9125	265.1825	274.5820	294.5923	319.8517	343.5920	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	(71)
Water heating gains (Table 5)													
	152.3158	149.7650	144.8514	134.0821	127.4857	120.5907	116.3559	119.8548	123.9570	131.6077	141.9313	150.9389	(72)
Total internal gains													
	653.2794	650.5153	630.3524	593.3839	556.6585	523.7777	504.6631	508.3753	527.7268	561.5767	602.0293	637.0228	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	4.9800	16.6187	0.3000	0.0000	0.7700	19.1178	(76)
West	3.5300	16.6187	0.3000	0.0000	0.7700	13.5514	(80)

Solar gains	32.6692	67.1355	116.6090	172.9395	207.2659	216.2037	201.7650	170.7039	137.1149	82.8303	42.3057	28.7264	(83)
Total gains	685.9486	717.6508	746.9614	766.3235	763.9244	739.9813	706.4281	679.0793	664.8417	644.4070	644.3350	665.7491	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	30.3838	30.5635	30.5635	31.3039	31.1154	32.0811	32.4843	32.4843	32.0811	31.3039	31.3039	31.1154	
alpha	3.0256	3.0376	3.0376	3.0869	3.0744	3.1387	3.1656	3.1656	3.1387	3.0869	3.0869	3.0744	
util living area													
	0.9068	0.8885	0.8547	0.7779	0.6639	0.5092	0.4021	0.4249	0.6142	0.7907	0.8753	0.9119	(86)
Living	19.4513	19.6333	19.9188	20.3753	20.7083	20.9113	20.9677	20.9614	20.8259	20.4264	19.9252	19.4545	
Non living	18.8455	19.0256	19.3024	19.7502	20.0520	20.2411	20.2904	20.2865	20.1745	19.8040	19.3250	18.8607	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.2077	19.6333	19.9188	20.3753	20.7083	20.9113	20.9677	20.9614	20.8259	20.4264	19.9252	19.6707	(87)
Th 2	20.2632	20.2673	20.2673	20.2834	20.2794	20.2996	20.3077	20.3077	20.2996	20.2834	20.2834	20.2794	(88)
util rest of house													
	0.8972	0.8771	0.8397	0.7545	0.6273	0.4591	0.3436	0.3654	0.5682	0.7644	0.8610	0.9028	(89)
MIT 2	19.5380	19.0256	19.3024	19.7502	20.0520	20.2411	20.2904	20.2865	20.1745	19.8040	19.3250	19.0592	(90)
Living area fraction										fLA = Living area / (4) =		0.3196	(91)
MIT	19.7520	19.2198	19.4994	19.9500	20.2617	20.4553	20.5069	20.5022	20.3827	20.0029	19.5168	19.2546	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7520	19.2198	19.4994	19.9500	20.2617	20.4553	20.5069	20.5022	20.3827	20.0029	19.5168	19.2546	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8898	0.8583	0.8219	0.7427	0.6263	0.4706	0.3608	0.3825	0.5739	0.7531	0.8436	0.8880	(94)
Useful gains	610.3675	615.9874	613.9316	569.1664	478.4751	348.2089	254.8526	259.7206	381.5666	485.3317	543.5328	591.1572	(95)
Ext temp.	4.7000	5.3000	6.7000	9.3000	12.3000	15.0000	16.6000	16.5000	14.1000	10.8000	7.5000	4.6000	(96)
Heat loss rate W													
	1079.6717	992.5909	912.6936	741.4636	557.6596	370.6022	262.1157	268.5111	426.8125	640.7179	836.6232	1026.4484	(97)
Space heating kWh													
	349.1623	253.0776	222.2789	124.0540	58.9133	0.0000	0.0000	0.0000	0.0000	115.6073	211.0251	323.8566	(98a)
Space heating requirement - total per year (kWh/year)												1657.9750	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	349.1623	253.0776	222.2789	124.0540	58.9133	0.0000	0.0000	0.0000	0.0000	115.6073	211.0251	323.8566	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1657.9750	
Space heating per m2											(98c) / (4) =	18.2275	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												269.9311	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	349.1623	253.0776	222.2789	124.0540	58.9133	0.0000	0.0000	0.0000	0.0000	115.6073	211.0251	323.8566	(98)
Space heating efficiency (main heating system 1)													
	269.9311	269.9311	269.9311	269.9311	269.9311	0.0000	0.0000	0.0000	0.0000	269.9311	269.9311	269.9311	(210)
Space heating fuel (main heating system)													
	129.3524	93.7564	82.3465	45.9576	21.8253	0.0000	0.0000	0.0000	0.0000	42.8284	78.1774	119.9775	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	270.9257	239.5518	254.2233	222.7027	215.3659	193.4882	190.4619	198.2911	200.7776	224.5893	239.6993	267.8447	(64)
Efficiency of water heater												281.3569	(216)
(217)m	281.3569	281.3569	281.3569	281.3569	281.3569	281.3569	281.3569	281.3569	281.3569	281.3569	281.3569	281.3569	(217)
Fuel for water heating, kWh/month													
	96.2925	85.1416	90.3562	79.1531	76.5455	68.7697	67.6941	70.4767	71.3605	79.8236	85.1940	95.1975	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	29.6563	26.7864	29.6563	28.6997	29.6563	28.6997	29.6563	29.6563	28.6997	29.6563	28.6997	29.6563	(231)
Lighting	30.8703	24.7653	22.2984	16.3368	12.6190	10.3098	11.5115	14.9631	19.4355	25.5005	28.8027	31.7283	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												614.2216	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												281.3569	
Water heating fuel used												966.0048	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.1900)													
mechanical ventilation fans (SFP = 1.1900)												349.1794	(230a)
Total electricity for the above, kWh/year												349.1794	(231)
Electricity for lighting (calculated in Appendix L)												249.1413	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												2178.5472	(238)

10a. Fuel costs - using BEDF prices (583)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	614.2216	28.4300	174.6232	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	966.0048	28.4300	274.6352	(247)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(247a)
Pumps, fans and electric keep-hot	349.1794	28.4300	99.2717	(249)
Energy for lighting	249.1413	28.4300	70.8309	(250)
Additional standing charges			0.0000	(251)
Total energy cost			619.3610	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	614.2216	0.1552	95.3232	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	966.0048	0.1410	136.1690	(264)
Space and water heating			231.4921	(265)
Pumps, fans and electric keep-hot	349.1794	0.1387	48.4355	(267)
Energy for lighting	249.1413	0.1443	35.9588	(268)
Total CO2, kg/year			315.8864	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	614.2216	1.5746	967.1236	(275)
Total CO2 associated with community systems			0.0000	(473)

Water heating (other fuel)	966.0048	1.5212	1469.5113 (278)
Space and water heating			2436.6349 (279)
Pumps, fans and electric keep-hot	349.1794	1.5128	528.2386 (281)
Energy for lighting	249.1413	1.5338	382.1413 (282)
Total Primary energy kWh/year			3347.0147 (286)

SAP 10 EPC IMPROVEMENTS

001

Current energy efficiency rating: B 84
Current environmental impact rating: A 97

N Solar water heating	Recommended
U Solar photovoltaic panels	Recommended
V2 Wind turbine	Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
N Solar water heating	+ 1.4	-£ 53	-23 kg (7.2%)
U Solar photovoltaic panels	+ 8.2	-£ 277	-207 kg (70.6%)

	Typical annual savings		Energy efficiency	Environmental impact
Recommended measures				
Solar water heating	£53	0.25 kg/m²	B 86	A 97
Solar photovoltaic panels	£277	2.27 kg/m²	A 94	A 99
Total Savings	£330	2.52 kg/m²		

Potential energy efficiency rating: A 94
Potential environmental impact rating: A 99

Fuel prices for cost data on this page from database revision number 583 TEST (01 Oct 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, West Pennines (England)):

	Current	Potential	Saving
Electricity	£619	£567	£53
Space heating	£274	£300	-£26
Water heating	£275	£196	£78
Lighting	£71	£71	£0
Generated (PV)	-£0	-£277	£277
Total cost of fuels	£619	£290	£330
Total cost of uses	£620	£290	£329
Delivered energy	24 kWh/m²	4 kWh/m²	20 kWh/m²
Carbon dioxide emissions	0.3 tonnes	0.1 tonnes	0.2 tonnes
CO2 emissions per m²	3 kg/m²	1 kg/m²	3 kg/m²
Primary energy	37 kWh/m²	17 kWh/m²	20 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	41.1800 (1b)	x	2.4800 (2b)	=	102.1264	(1b) - (3b)
First floor	49.7800 (1c)	x	2.7800 (2c)	=	138.3884	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	90.9600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	240.5148	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.2500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2125	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													
	0.2709	0.2656	0.2603	0.2338	0.2284	0.2019	0.2019	0.1966	0.2125	0.2284	0.2391	0.2497	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	81.0000	(23c)

Effective ac	0.3659	0.3606	0.3553	0.3287	0.3234	0.2969	0.2969	0.2916	0.3075	0.3234	0.3341	0.3447	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Door			4.1400	1.0000	4.1400			(26)
Window			8.5100	0.7752	6.5969			(27)
GF			41.1800	0.0900	3.7062	75.0000	3088.5000	(28a)
Exposed Floor			8.6000	0.1400	1.2040	20.0000	172.0000	(28b)
Main	71.8472	12.6500	59.1972	0.1300	7.6956	9.0000	532.7748	(29a)
PIJ	49.7800		49.7800	0.1300	6.4714	9.0000	448.0200	(30)
Total net area of external elements Aum(A, m2)			171.4072					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.8141			(33)
Main dwelling								
Party Wall 1			81.2200	0.0000	0.0000	20.0000	1624.4000	(32)
Timber			96.4800			9.0000	868.3200	(32c)
FF			41.1800			18.0000	741.2400	(32d)
GF			41.1800			9.0000	370.6200	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 7845.8748	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	86.2563	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	8.6300	0.1150	0.9925
E3 Sill	8.6300	0.0170	0.1467
E4 Jamb	28.2000	0.0940	2.6508
E5 Ground floor (normal)	16.6400	0.0670	1.1149
E16 Corner (normal)	4.9600	0.0680	0.3373
E12 Gable (insulation at ceiling level)	11.0000	0.0770	0.8470
E6 Intermediate floor within a dwelling	11.0000	0.0320	0.3520
E17 Corner (inverted - internal area greater than external area)	4.9600	-0.0290	-0.1438
P1 Party wall - Ground floor	12.4600	0.3200	3.9872
E20 Exposed floor (normal)	6.4400	0.0790	0.5088
E21 Exposed floor (inverted)	12.0800	0.0630	0.7610
E18 Party wall between dwellings	11.1200	0.0920	1.0230
P4 Party wall - Roof (insulation at ceiling level)	18.1000	0.1020	1.8462
E25 Staggered party wall between dwellings	9.9200	0.0560	0.5555

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	14.9790	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	44.7932	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	29.0444	28.6228	28.2011	26.0928	25.6712	23.5629	23.5629	23.1413	24.4062	25.6712	26.5145	27.3578	(38)
Heat transfer coeff													
	73.8376	73.4159	72.9943	70.8860	70.4644	68.3561	68.3561	67.9345	69.1994	70.4644	71.3077	72.1510	(39)
Average = Sum(39)m / 12 =												70.7806	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8118	0.8071	0.8025	0.7793	0.7747	0.7515	0.7515	0.7469	0.7608	0.7747	0.7839	0.7932	(40)
HLP (average)												0.7782	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.6386	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
68.4610	67.4321	65.9329	63.0644	60.9476	58.5869	57.2450	58.7329	60.3639	62.8986	65.8287	68.1987	(42a)

Hot water usage for baths

29.5637	29.1246	28.5063	27.3663	26.5127	25.5661	25.0549	25.6688	26.3373	27.3502	28.5137	29.4637	(42b)

Hot water usage for other uses

41.6522	40.1376	38.6230	37.1084	35.5937	34.0791	34.0791	35.5937	37.1084	38.6230	40.1376	41.6522	(42c)

Average daily hot water use (litres/day)	128.3946	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	139.6769	136.6944	133.0622	127.5391	123.0540	118.2321	116.3790	119.9955	123.8096	128.8717	134.4799	139.3147	(44)
Energy conte	221.2141	194.6510	204.5117	174.5947	165.6543	145.3802	140.7503	148.5795	152.6696	174.8777	191.5913	218.1331	(45)
Energy content (annual)											Total = Sum(45)m =	2132.6075	
Distribution loss (46)m = 0.15 x (45)m													
	33.1821	29.1976	30.6768	26.1892	24.8482	21.8070	21.1126	22.2869	22.9004	26.2317	28.7387	32.7200	(46)

Water storage loss:		
Store volume	210.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):	1.5800	(48)
Temperature factor from Table 2b	0.5400	(49)
Enter (49) or (54) in (55)	0.8532	(55)

Total storage loss

26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(56)

If cylinder contains dedicated solar storage

17.0031	15.3576	17.0031	16.4546	17.0031	16.4546	17.0031	17.0031	16.4546	17.0031	16.4546	17.0031	(57)
Primary loss 23.2624	21.0112	21.8667	15.7584	10.4681	9.9053	10.2355	11.1660	17.1091	21.8667	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

261.4795	231.0198	243.3814	206.8077	193.1255	171.7400	167.9889	176.7485	186.2333	213.7474	230.5579	258.3985	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)

Aperture area of solar collector	3.0000	(H1)
Zero-loss collector efficiency	0.8000	(H2)
Collector linear heat loss coefficient	1.8000	(H3)
Collector 2nd order heat loss coefficient	0.0000	(H4)
Collector loop efficiency	0.9000	(H5)
Incidence angle modifier	1.0000	(H6)

Overshading factor												0.8000	(H8)
Overall heat loss coefficient of system												6.5000	(H10)
Heat loss coefficient of collector loop												3.9667	(H11)
Dedicated solar storage volume												75.0000	(H12)
If combined cylinder, total volume of cylinder												210.0000	(H13)
Effective solar volume												115.5000	(H14)
Reference volume												225.0000	(H15)
Storage tank correction coefficient												1.1814	(H16)
Heat delivered to hot water												654.6757	(H24)
Heat delivered to space heating												0.0000	(H29)
Solar input												654.6757	
Solar input	-0.0000	-20.1906	-62.4438	-83.8682	-107.6151	-99.0457	-98.2732	-86.8675	-61.6791	-33.2791	-1.4133	-0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	261.4795	210.8291	180.9377	122.9394	85.5104	72.6943	69.7156	89.8809	124.5542	180.4683	229.1446	258.3985	(64)
									Total per year (kWh/year) = Sum(64)m =			1886.5527	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
								Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =				0.0000	(64a)
Heat gains from water heating, kWh/month													
	105.7660	93.8165	99.0959	83.8231	77.0570	69.4268	68.5903	71.9379	77.6136	89.2426	94.8774	104.7416	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	35.2685	31.3252	25.4754	19.2865	14.4169	12.1713	13.1516	17.0949	22.9447	29.1336	34.0032	36.2488	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	359.4520	363.1820	353.7825	333.7722	308.5128	284.7725	268.9125	265.1825	274.5820	294.5923	319.8517	343.5920	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	(71)
Water heating gains (Table 5)													
	142.1587	139.6079	133.1934	116.4210	103.5712	96.4261	92.1913	96.6907	107.7967	119.9497	131.7741	140.7817	(72)
Total internal gains													
	643.1223	640.3582	618.6944	575.7228	532.7440	499.6131	480.4985	485.2112	511.5665	549.9188	591.8722	626.8656	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	4.9800	19.6403	0.3000	0.0000	0.7700	22.5938	(76)
West	3.5300	19.6403	0.3000	0.0000	0.7700	16.0153	(80)

Solar gains	38.6090	75.5274	124.3829	181.4051	222.3188	227.5828	216.6681	186.1147	144.6625	89.6197	48.1409	31.7502	(83)
Total gains	681.7313	715.8856	743.0774	757.1279	755.0628	727.1959	697.1666	671.3260	656.2290	639.5384	640.0131	658.6158	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	29.5163	29.6858	29.8573	30.7453	30.9292	31.8832	31.8832	32.0811	31.4946	30.9292	30.5635	30.2062	
alpha	2.9678	2.9791	2.9905	3.0497	3.0619	3.1255	3.1255	3.1387	3.0996	3.0619	3.0376	3.0137	
util living area													
	0.9149	0.8975	0.8632	0.7979	0.6981	0.5458	0.4131	0.4419	0.6261	0.8025	0.8868	0.9205	(86)
Living	19.2926	19.4854	19.8269	20.2792	20.6349	20.8832	20.9633	20.9544	20.8091	20.3747	19.7986	19.2886	
Non living	18.6754	18.8666	19.2017	19.6505	19.9836	20.2157	20.2759	20.2741	20.1501	19.7496	19.1904	18.6835	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.1265	19.4854	19.8269	20.2792	20.6349	20.8832	20.9633	20.9544	20.8091	20.3747	19.7986	19.5280	(87)
Th 2	20.2432	20.2472	20.2512	20.2713	20.2753	20.2956	20.2956	20.2996	20.2875	20.2753	20.2673	20.2592	(88)
util rest of house													
	0.9060	0.8870	0.8488	0.7761	0.6646	0.4972	0.3525	0.3814	0.5794	0.7774	0.8737	0.9123	(89)
MIT 2	19.4412	18.8666	19.2017	19.6505	19.9836	20.2157	20.2759	20.2741	20.1501	19.7496	19.1904	18.9039	(90)
Living area fraction										fLA = Living area / (4) =		0.3196	(91)
MIT	19.6602	19.0644	19.4015	19.8514	20.1917	20.4290	20.4956	20.4915	20.3607	19.9494	19.3848	19.1034	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6602	19.0644	19.4015	19.8514	20.1917	20.4290	20.4956	20.4915	20.3607	19.9494	19.3848	19.1034	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8985	0.8676	0.8301	0.7624	0.6605	0.5067	0.3701	0.3984	0.5845	0.7649	0.8555	0.8972	(94)
Useful gains	612.5056	621.0786	616.8621	577.2369	498.7053	368.4672	258.0023	267.4529	383.5338	489.1698	547.5142	590.8996	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1134.1604	1039.8893	941.7389	776.3046	598.3657	398.4481	266.2854	277.9551	433.2382	658.7983	875.9978	1075.2926	(97)
Space heating kWh													
	388.1112	281.4408	241.7084	143.3288	74.1473	0.0000	0.0000	0.0000	0.0000	126.2036	236.5082	360.3884	(98a)
Space heating requirement - total per year (kWh/year)												1851.8366	
Solar heating kWh													
	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	388.1112	281.4408	241.7084	143.3288	74.1473	0.0000	0.0000	0.0000	0.0000	126.2036	236.5082	360.3884	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1851.8366	
Space heating per m2											(98c) / (4) =	20.3588	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												270.8847	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	388.1112	281.4408	241.7084	143.3288	74.1473	0.0000	0.0000	0.0000	0.0000	126.2036	236.5082	360.3884	(98)
Space heating efficiency (main heating system 1)													
	270.8847	270.8847	270.8847	270.8847	270.8847	0.0000	0.0000	0.0000	0.0000	270.8847	270.8847	270.8847	(210)
Space heating fuel (main heating system)													
	143.2754	103.8969	89.2293	52.9114	27.3723	0.0000	0.0000	0.0000	0.0000	46.5894	87.3095	133.0413	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	261.4795	210.8291	180.9377	122.9394	85.5104	72.6943	69.7156	89.8809	124.5542	180.4683	229.1446	258.3985	(64)
Efficiency of water heater												281.0493	(216)
(217)m	281.0493	281.0493	281.0493	281.0493	281.0493	281.0493	281.0493	281.0493	281.0493	281.0493	281.0493	281.0493	(217)
Fuel for water heating, kWh/month													
	93.0369	75.0150	64.3793	43.7430	30.4254	25.8653	24.8055	31.9805	44.3176	64.2123	81.5318	91.9407	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	36.4509	32.9233	36.4509	35.2750	36.4509	35.2750	36.4509	36.4509	35.2750	36.4509	35.2750	36.4509	(231)
Lighting	30.8703	24.7653	22.2984	16.3368	12.6190	10.3098	11.5115	14.9631	19.4355	25.5005	28.8027	31.7283	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-37.4213	-55.2968	-82.6096	-94.8967	-102.3683	-93.3004	-92.1878	-86.5597	-76.2056	-63.7310	-41.7430	-31.9501	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-12.6652	-28.2832	-59.7367	-95.8754	-133.3145	-138.4133	-136.4638	-113.2143	-80.2575	-43.1148	-17.6668	-9.9637	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												683.6254	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												281.0493	
Water heating fuel used												671.2534	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.1900)													
mechanical ventilation fans (SFP = 1.1900)												349.1794	(230a)
pump for solar water heating												80.0000	(230g)
Total electricity for the above, kWh/year												429.1794	(231)
Electricity for lighting (calculated in Appendix L)												249.1413	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1727.2394	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												305.9602	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	683.6254	16.4900	112.7298	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	671.2534	16.4900	110.6897	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	349.1794	16.4900	57.5797	(249)
Pump for solar water heating	80.0000	16.4900	13.1920	(249)
Energy for lighting	249.1413	16.4900	41.0834	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-858.2703	16.4900	-141.5288	
PV Unit electricity exported	-868.9691	5.5900	-48.5754	
Total			-190.1041	(252)
Total energy cost			145.1705	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.3844	(257)
SAP value		93.7691	
SAP rating (Section 12)		94	(258)
SAP band		A	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	683.6254	0.1551	106.0146	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	671.2534	0.1462	98.1652	(264)
Space and water heating			204.1797	(265)
Pumps, fans and electric keep-hot	429.1794	0.1387	59.5325	(267)
Energy for lighting	249.1413	0.1443	35.9588	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-858.2703	0.1343	-115.2684	
PV Unit electricity exported	-868.9691	0.1239	-107.6587	
Total			-222.9271	(269)
Total CO2, kg/year			76.7439	(272)
CO2 emissions per m2			0.8400	(273)
EI value			99.2436	
EI rating			99	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	41.1800	(1b) x	2.4800	(2b) =	102.1264	(1b) - (3b)
First floor	49.7800	(1c) x	2.7800	(2c) =	138.3884	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	90.9600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		240.5148	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.2500 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2125 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.6000	4.5000	4.5000	4.1000	4.2000	3.7000	3.5000	3.5000	3.7000	4.1000	4.1000	4.2000	(22)
Wind factor	1.1500	1.1250	1.1250	1.0250	1.0500	0.9250	0.8750	0.8750	0.9250	1.0250	1.0250	1.0500	(22a)
Adj infilt rate	0.2444	0.2391	0.2391	0.2178	0.2231	0.1966	0.1859	0.1859	0.1966	0.2178	0.2178	0.2231	(22b)
Balanced mechanical ventilation with heat recovery													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												81.0000	(23c)
Effective ac	0.3394	0.3341	0.3341	0.3128	0.3181	0.2916	0.2809	0.2809	0.2916	0.3128	0.3128	0.3181	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door			4.1400	1.0000	4.1400			(26)
Window			8.5100	0.7752	6.5969			(27)
GF			41.1800	0.0900	3.7062	75.0000	3088.5000	(28a)
Exposed Floor			8.6000	0.1400	1.2040	20.0000	172.0000	(28b)
Main	71.8472	12.6500	59.1972	0.1300	7.6956	9.0000	532.7748	(29a)
PIJ	49.7800		49.7800	0.1300	6.4714	9.0000	448.0200	(30)
Total net area of external elements Aum(A, m2)			171.4072					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.8141			(33)
Main dwelling								
Party Wall 1			81.2200	0.0000	0.0000	20.0000	1624.4000	(32)
Timber			96.4800			9.0000	868.3200	(32c)
FF			41.1800			18.0000	741.2400	(32d)
GF			41.1800			9.0000	370.6200	(32e)
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =			7845.8748	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 86.2563 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	8.6300	0.1150	0.9925
E3 Sill	8.6300	0.0170	0.1467
E4 Jamb	28.2000	0.0940	2.6508
E5 Ground floor (normal)	16.6400	0.0670	1.1149
E16 Corner (normal)	4.9600	0.0680	0.3373
E12 Gable (insulation at ceiling level)	11.0000	0.0770	0.8470
E6 Intermediate floor within a dwelling	11.0000	0.0320	0.3520
E17 Corner (inverted - internal area greater than external area)	4.9600	-0.0290	-0.1438
P1 Party wall - Ground floor	12.4600	0.3200	3.9872
E20 Exposed floor (normal)	6.4400	0.0790	0.5088
E21 Exposed floor (inverted)	12.0800	0.0630	0.7610
E18 Party wall between dwellings	11.1200	0.0920	1.0230
P4 Party wall - Roof (insulation at ceiling level)	18.1000	0.1020	1.8462
E25 Staggered party wall between dwellings	9.9200	0.0560	0.5555

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 14.9790 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 44.7932 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	26.9362	26.5145	26.5145	24.8279	25.2495	23.1413	22.2980	22.2980	23.1413	24.8279	24.8279	25.2495	(38)
Heat transfer coeff	71.7293	71.3077	71.3077	69.6211	70.0427	67.9345	67.0912	67.0912	67.9345	69.6211	69.6211	70.0427	(39)
Average = Sum(39)m / 12 =												69.4454	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7886	0.7839	0.7839	0.7654	0.7700	0.7469	0.7376	0.7376	0.7469	0.7654	0.7654	0.7700	(40)
HLP (average)												0.7635	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6386 (42)
Hot water usage for mixer showers

68.4610	67.4321	65.9329	63.0644	60.9476	58.5869	57.2450	58.7329	60.3639	62.8986	65.8287	68.1987	(42a)

Hot water usage for baths

29.5637	29.1246	28.5063	27.3663	26.5127	25.5661	25.0549	25.6688	26.3373	27.3502	28.5137	29.4637	(42b)

Hot water usage for other uses

41.6522	40.1376	38.6230	37.1084	35.5937	34.0791	34.0791	35.5937	37.1084	38.6230	40.1376	41.6522	(42c)

Average daily hot water use (litres/day) 128.3946 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	139.6769	136.6944	133.0622	127.5391	123.0540	118.2321	116.3790	119.9955	123.8096	128.8717	134.4799	139.3147	(44)
Energy conte	221.2141	194.6510	204.5117	174.5947	165.6543	145.3802	140.7503	148.5795	152.6696	174.8777	191.5913	218.1331	(45)
Energy content (annual)										Total = Sum(45)m =		2132.6075	

Distribution loss (46)m = 0.15 x (45)m

33.1821	29.1976	30.6768	26.1892	24.8482	21.8070	21.1126	22.2869	22.9004	26.2317	28.7387	32.7200	(46)

Water storage loss:
Store volume 210.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.5800 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.8532 (55)
Total storage loss

26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(56)

If cylinder contains dedicated solar storage

17.0031	15.3576	17.0031	16.4546	17.0031	16.4546	17.0031	17.0031	16.4546	17.0031	16.4546	17.0031	(57)
23.2624	21.0112	21.8667	15.7584	10.4681	9.9053	10.2355	11.1660	17.1091	21.8667	22.5120	23.2624	(59)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

261.4795	231.0198	243.3814	206.8077	193.1255	171.7400	167.9889	176.7485	186.2333	213.7474	230.5579	258.3985	(62)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)

Aperture area of solar collector 3.0000 (H1)
Zero-loss collector efficiency 0.8000 (H2)
Collector linear heat loss coefficient 1.8000 (H3)
Collector 2nd order heat loss coefficient 0.0000 (H4)
Collector loop efficiency 0.9000 (H5)
Incidence angle modifier 1.0000 (H6)
Overshading factor 0.8000 (H8)
Overall heat loss coefficient of system 6.5000 (H10)
Heat loss coefficient of collector loop 3.9667 (H11)
Dedicated solar storage volume 75.0000 (H12)
If combined cylinder, total volume of cylinder 210.0000 (H13)
Effective solar volume 115.5000 (H14)
Reference volume 225.0000 (H15)
Storage tank correction coefficient 1.1814 (H16)
Heat delivered to hot water 599.1897 (H24)
Heat delivered to space heating 0.0000 (H29)
Solar input 599.1897

-0.0000	-14.4822	-56.8249	-79.3403	-100.2904	-94.0949	-90.8995	-78.3168	-56.9604	-27.9802	-0.0000	-0.0000	(63c)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

261.4795	216.5376	186.5565	127.4673	92.8350	77.6451	77.0894	98.4317	129.2728	185.7672	230.5579	258.3985	(64)
									Total per year (kWh/year) = Sum(64)m =		1942.0387	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)

Heat gains from water heating, kWh/month

105.7660	93.8165	99.0959	83.8231	77.0570	69.4268	68.5903	71.9379	77.6136	89.2426	94.8774	104.7416	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	35.2685	31.3252	25.4754	19.2865	14.4169	12.1713	13.1516	17.0949	22.9447	29.1336	34.0032	36.2488	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	359.4520	363.1820	353.7825	333.7722	308.5128	284.7725	268.9125	265.1825	274.5820	294.5923	319.8517	343.5920	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	(69)

Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	(71)
Water heating gains (Table 5)	142.1587	139.6079	133.1934	116.4210	103.5712	96.4261	92.1913	96.6907	107.7967	119.9497	131.7741	140.7817	(72)
Total internal gains	643.1223	640.3582	618.6944	575.7228	532.7440	499.6131	480.4985	485.2112	511.5665	549.9188	591.8722	626.8656	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	4.9800	16.6187	0.3000	0.0000	0.7700	19.1178	(76)
West	3.5300	16.6187	0.3000	0.0000	0.7700	13.5514	(80)

Solar gains	32.6692	67.1355	116.6090	172.9395	207.2659	216.2037	201.7650	170.7039	137.1149	82.8303	42.3057	28.7264	(83)
Total gains	675.7915	707.4937	735.3035	748.6623	740.0099	715.8167	682.2635	655.9152	648.6814	632.7491	634.1778	655.5920	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	30.3838	30.5635	30.5635	31.3039	31.1154	32.0811	32.4843	32.4843	32.0811	31.3039	31.3039	31.1154	
alpha	3.0256	3.0376	3.0376	3.0869	3.0744	3.1387	3.1656	3.1656	3.1387	3.0869	3.0869	3.0744	
util living area	0.9097	0.8917	0.8591	0.7862	0.6771	0.5231	0.4148	0.4381	0.6248	0.7970	0.8793	0.9148	(86)
Living	19.4308	19.6142	19.8995	20.3539	20.6910	20.9043	20.9647	20.9579	20.8171	20.4115	19.9069	19.4335	
Non living	18.8258	19.0073	19.2842	19.7308	20.0377	20.2363	20.2887	20.2845	20.1678	19.7907	19.3077	18.8405	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.1973	19.6142	19.8995	20.3539	20.6910	20.9043	20.9647	20.9579	20.8171	20.4115	19.9069	19.6526	(87)
Th 2	20.2632	20.2673	20.2673	20.2834	20.2794	20.2996	20.3077	20.3077	20.2996	20.2834	20.2834	20.2794	(88)
util rest of house	0.9004	0.8806	0.8443	0.7633	0.6408	0.4723	0.3550	0.3772	0.5788	0.7711	0.8653	0.9060	(89)
MIT 2	19.5279	19.0073	19.2842	19.7308	20.0377	20.2363	20.2887	20.2845	20.1678	19.7907	19.3077	19.0418	(90)
Living area fraction									fLA = Living area / (4) =			0.3196	(91)
MIT	19.7418	19.2013	19.4809	19.9299	20.2465	20.4498	20.5048	20.4997	20.3753	19.9891	19.4992	19.2370	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7418	19.2013	19.4809	19.9299	20.2465	20.4498	20.5048	20.4997	20.3753	19.9891	19.4992	19.2370	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8930	0.8618	0.8264	0.7509	0.6390	0.4835	0.3723	0.3945	0.5840	0.7595	0.8478	0.8912	(94)
Useful gains	603.4859	609.7347	607.6374	562.2002	472.8993	346.0816	254.0301	258.7483	378.8167	480.5478	537.6294	584.2708	(95)
Ext temp.	4.7000	5.3000	6.7000	9.3000	12.3000	15.0000	16.6000	16.5000	14.1000	10.8000	7.5000	4.6000	(96)
Heat loss rate W	1078.9393	991.2675	911.3729	740.0682	556.5933	370.2267	261.9745	268.3436	426.3094	639.7559	835.3990	1025.2150	(97)
Space heating kWh	353.7374	256.3901	225.9792	128.0650	62.2683	0.0000	0.0000	0.0000	0.0000	118.4508	214.3941	328.0625	(98a)
Space heating requirement - total per year (kWh/year)												1687.3474	
Solar heating kWh	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	353.7374	256.3901	225.9792	128.0650	62.2683	0.0000	0.0000	0.0000	0.0000	118.4508	214.3941	328.0625	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1687.3474	
Space heating per m2											(98c) / (4) =	18.5504	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	269.9311	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	353.7374	256.3901	225.9792	128.0650	62.2683	0.0000	0.0000	0.0000	0.0000	118.4508	214.3941	328.0625	(98)
Space heating efficiency (main heating system 1)	269.9311	269.9311	269.9311	269.9311	269.9311	0.0000	0.0000	0.0000	0.0000	269.9311	269.9311	269.9311	(210)
Space heating fuel (main heating system)	131.0473	94.9835	83.7174	47.4436	23.0682	0.0000	0.0000	0.0000	0.0000	43.8819	79.4255	121.5357	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	261.4795	216.5376	186.5565	127.4673	92.8350	77.6451	77.0894	98.4317	129.2728	185.7672	230.5579	258.3985	(64)
Efficiency of water heater												281.3569	(216)
(217)m	281.3569	281.3569	281.3569	281.3569	281.3569	281.3569	281.3569	281.3569	281.3569	281.3569	281.3569	281.3569	(217)
Fuel for water heating, kWh/month	92.9352	76.9619	66.3060	45.3045	32.9955	27.5967	27.3991	34.9846	45.9462	66.0255	81.9450	91.8401	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	36.4509	32.9233	36.4509	35.2750	36.4509	35.2750	36.4509	36.4509	35.2750	36.4509	35.2750	36.4509	(231)
Lighting	30.8703	24.7653	22.2984	16.3368	12.6190	10.3098	11.5115	14.9631	19.4355	25.5005	28.8027	31.7283	(232)

Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-32.3344	-50.2115	-78.6710	-91.6951	-98.0812	-90.9873	-89.0335	-82.6503	-73.7830	-60.0829	-37.4203	-29.2209 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-10.0465	-24.0818	-54.7786	-90.1742	-121.6439	-129.1407	-123.8907	-100.5819	-74.5168	-38.6686	-14.7883	-8.7012 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year		
Space heating fuel - main system 1	625.1031	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	281.3569	
Water heating fuel used	690.2402	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.1900)		
mechanical ventilation fans (SFP = 1.1900)	349.1794	(230a)
pump for solar water heating	80.0000	(230g)
Total electricity for the above, kWh/year	429.1794	(231)
Electricity for lighting (calculated in Appendix L)	249.1413	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1605.1846	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	388.4794	(238)

10a. Fuel costs - using BEDF prices (583)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	625.1031	28.4300	177.7168	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	690.2402	28.4300	196.2353	(247)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(247a)
Pumps, fans and electric keep-hot	349.1794	28.4300	99.2717	(249)
Pump for solar water heating	80.0000	28.4300	22.7440	(249)
Energy for lighting	249.1413	28.4300	70.8309	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-814.1715	28.4300	-231.4690	
PV Unit electricity exported	-791.0131	5.8100	-45.9579	
Total			-277.4268	(252)
Total energy cost			289.3718	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	625.1031	0.1551	96.9678	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	690.2402	0.1458	100.6408	(264)
Space and water heating			197.6086	(265)
Pumps, fans and electric keep-hot	429.1794	0.1387	59.5325	(267)
Energy for lighting	249.1413	0.1443	35.9588	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-814.1715	0.1339	-109.0444	
PV Unit electricity exported	-791.0131	0.1236	-97.8071	
Total			-206.8515	(269)
Total CO2, kg/year			86.2483	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	625.1031	1.5743	984.0930	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	690.2402	1.5394	1062.5234	(278)
Space and water heating			2046.6164	(279)
Pumps, fans and electric keep-hot	429.1794	1.5128	649.2626	(281)
Energy for lighting	249.1413	1.5338	382.1413	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-814.1715	1.4950	-1217.1654	
PV Unit electricity exported	-791.0131	0.4538	-358.9670	
Total			-1576.1324	(283)
Total Primary energy kWh/year			1501.8879	(286)

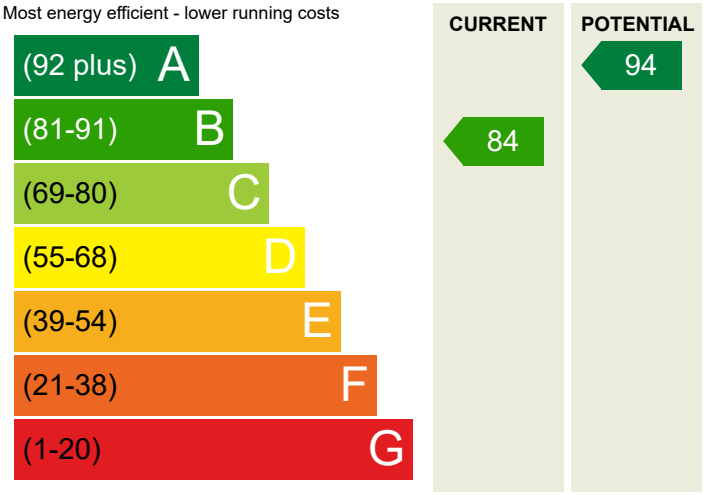
Energy Report

Dwelling Address	836 Rochdale Road, MANCHESTER, M9 8FA
Reference	78449-10-001
Assessment Date	02/07/2025
Submission Date	
Property Type	House, Mid-Terrace
Total Floor Area	91

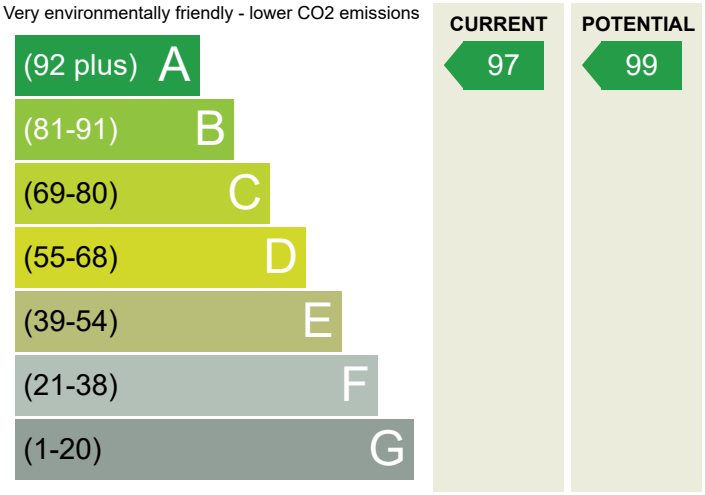
This Energy Report has been generated using the UK's National Calculation Methodology for dwellings, Standard Assessment Procedure (SAP). This methodology is used to assess the energy efficiency of dwellings which is calculated based on a dwelling's heating, hot water, ventilation and lighting usage.

This document is not an Energy Performance Certificate (EPC) as required by the Energy Performance of Buildings Regulations

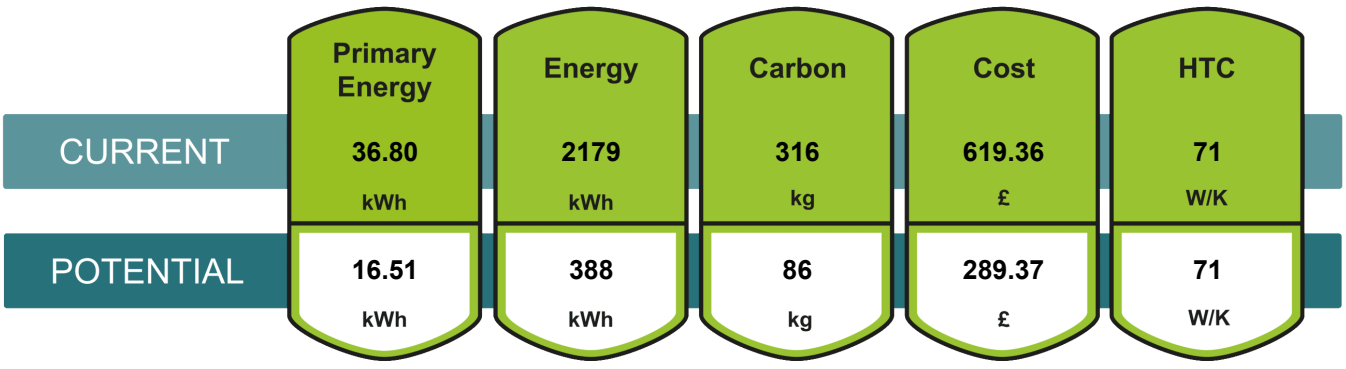
Energy Efficiency Rating



Carbon Dioxide (CO2) Emissions Rating



Additional ratings for your home



Energy Report

Breakdown of property's energy performance

Each feature is assessed as one of the following:

Very Poor | Poor | Average | Good | Very Good

Feature	Description	Energy Performance
Walls	Average thermal transmittance 0.13 W/m²K	Very Good
Roof	Average thermal transmittance 0.13 W/m²K	Very Good
Floor	Average thermal transmittance 0.1 W/m²K	Very Good
Windows	High performance glazing	Very Good
Main heating	Air source heat pump, radiators, electric	Good
Main heating controls	Programmer, room thermostat and TRVs	Good
Secondary heating	None	
Hot water	From main system	Good
Lighting	Good lighting efficiency	Good
Air tightness	Air permeability [AP50] = 5.0 m³/h.m² (as tested)	Good

Recommendations

The recommended measures provided below will help to improve the energy efficiency of the dwelling.
To reach the dwelling's potential energy rating all of the recommended measures shown below would need to be installed.
Having these measures installed individually or in any other order may give a different result when compared with the cumulative potential rating.

Recommended measures	Cumulative savings (per year)	Cumulative rating	Typical costs	Incremental savings (per year)	Cumulative CO2 rating
Solar water heating	£53	B 86	£4,000 - £7,000	£53	A 97
Photovoltaic	£330	A 94	£8,000 - £10,000	£277	A 99

Energy Report

The typical cost is based on average installation prices across the country so may not be representative of the actual costs in your area.

Estimated energy costs of the dwelling

The table below shows the estimated running costs of the space and water heating and lighting within the dwelling. It does not include the energy used from household appliances. The estimated annual costs after potential improvements indicates the total energy cost if all recommended measures named above were installed.

	Estimated annual costs	Estimated annual costs after potential improvements	Potential future savings
Lighting	£71	£71	
Heating	£274	£300	
Hot Water	£275	£196	
New Technologies e.g. Impact of PV	£0	-(£277)	
TOTAL	£619	£289	

Estimated energy use and potential savings

Space Heating
614
kWh per year

Water Heating
966
kWh per year

Energy Report

About this document

Created by:	
Company/Trading name:	
Phone number:	
Email address:	

Disclaimer

This Energy Report should not under any circumstances be treated as a Condition Survey and cannot be used to indicate that any element of the dwelling (e.g.heating system) is working correctly.
This Energy Report must not be used in situations where an Energy Performance Certificate (EPC) is required.
This Energy Report is generated from a set of data inputs which may not reflect the actual dimensions, services or construction of the dwelling.
The calculation used to generate this report reflects the SAP Methodology current at the time of report generation.

Glossary terms for additional metrics

Primary Energy	The measure of the energy required for lighting, heating and hot water in a property. This includes the efficiency of the property's heating system, power station efficiency for electricity and the energy used to produce the fuel and deliver it to the property.
Energy Used	The estimated amount of fuel energy for lighting, heating and hot water for the property. The estimate is based on typical usage which is likely to be different to actual consumption.
Carbon (CO2)	The current emissions based on the energy estimates.
Cost	The estimated cost of energy. The cost of each unit of fuel is based on an industry standard which is likely to be different to those the occupier actually pays.
Heat Transfer Coefficient	Heat flow through the property envelope where internal and external temperatures are different.

Building Regulations England Part L (BREL) Compliance Report

Approved Document L1 2021 Edition, England assessed by Array SAP 10 program, Array

Date: Fri 03 Oct 2025 15:03:28

Project Information			
Assessed By	Paul Goddard	Building Type	House, Mid-terrace
OCDEA Registration	EES/005113	Assessment Date	2025-10-03

Dwelling Details			
Assessment Type	As built	Total Floor Area	91 m^2
Site Reference	78449-11	Plot Reference	001
Address	836 Rochdale Road, MANCHESTER, M9 8FA		

Client Details	
Name	-
Company	John Southworth
Address	Unit 10, Charles Street, DUKINFIELD, SK16 4SD

This report covers items included within the SAP calculations. It is not a complete report of regulations compliance.

1a Target emission rate and dwelling emission rate		
Fuel for main heating system	Electricity	
Target carbon dioxide emission rate	*11.59 $kgCO_2/m^2$*	
Dwelling carbon dioxide emission rate	3.63 $kgCO_2/m^2$	**OK**
1b Target primary energy rate and dwelling primary energy		
Target primary energy	*60.76 kWh_{PE}/m^2*	
Dwelling primary energy	38.42 kWh_{PE}/m^2	**OK**
1c Target fabric energy efficiency and dwelling fabric energy efficiency		
Target fabric energy efficiency	*37.6 kWh/m^2*	
Dwelling fabric energy efficiency	34.2 kWh/m^2	**OK**

2a Fabric U-values				
Element	***Maximum permitted average U-Value [W/m^2K]***	**Dwelling average U-Value [W/m^2K]**	**Element with highest individual U-Value**	
External walls	*0.26*	0.13	Walls (1) (0.13)	**OK**
Party walls	*0.2*	0	Party Wall (1) (0)	**N/A**
Curtain walls	*1.6*	0	N/A	**N/A**
Floors	*0.18*	0.1	Exposed Floor (0.14)	**OK**
Roofs	*0.16*	0.13	Roof (1) (0.13)	**OK**
Windows, doors, and roof windows	*1.6*	0.87	Front (1)	**OK**
Rooflights	*2.2*	N/A	N/A	**N/A**

2b Envelope elements (better than typically expected values are flagged with a subsequent (!))		
Name	**Net area [m^2]**	**U-Value [W/m^2K]**
Exposed wall: Walls (1)	59.2	0.13 **(!)**
Party wall: Party Wall (1)	81.22	0 **(!)**
Ground floor: GF, GF	41.18	0.09 **(!)**
Upper floor: Exposed Floor, Exposed Floor	8.6	0.14
Exposed roof: Roof (1)	49.779998779296875	0.13

2c Openings (better than typically expected values are flagged with a subsequent (!))				
Name	**Area [m^2]**	**Orientation**	**Frame factor**	**U-Value [W/m^2K]**
Front, Door	1.99	East	N/A	1 **(!)**
Front, Window	4.98	East	1.0	0.8 **(!)**
Rear, Window	3.53	West	1.0	0.8 **(!)**
Rear, Door	2.15	West	N/A	1 **(!)**

2d Thermal bridging (better than typically expected values are flagged with a subsequent (!))				
Building part **1**: Thermal bridging calculated from linear thermal transmittances for each junction				
Main element	**Junction detail**	**Source**	**Psi value [W/mK]**	**Drawing / reference**
External wall	E2: Other lintels (including other steel lintels)	Calculated by person with suitable expertise	0.115	Thermal Bridge Report

Main element	Junction detail	Source	Psi value [W/mK]	Drawing / reference
External wall	E3: Sill	Calculated by person with suitable expertise	0.017 **(!)**	Thermal Bridge Report
External wall	E4: Jamb	Calculated by person with suitable expertise	0.094	Thermal Bridge Report
External wall	E5: Ground floor (normal)	Calculated by person with suitable expertise	0.067	Thermal Bridge Report
External wall	E16: Corner (normal)	Calculated by person with suitable expertise	0.068	Thermal Bridge Report
External wall	E12: Gable (insulation at ceiling level)	Calculated by person with suitable expertise	0.077	Thermal Bridge Report
External wall	E6: Intermediate floor within a dwelling	Calculated by person with suitable expertise	0.032 **(!)**	Thermal Bridge Report
External wall	E17: Corner (inverted - internal area greater than external area)	Calculated by person with suitable expertise	-0.029 **(!)**	Thermal Bridge Report
Party wall	P1: Ground floor	SAP table default	0.32	K1
External wall	E20: Exposed floor (normal)	Calculated by person with suitable expertise	0.079	Thermal Bridge Report
External wall	E21: Exposed floor (inverted)	Calculated by person with suitable expertise	0.063	Thermal Bridge Report
External wall	E18: Party wall between dwellings	Calculated by person with suitable expertise	0.092	Thermal Bridge Report
Party wall	P4: Roof (insulation at ceiling level)	Calculated by person with suitable expertise	0.102	Thermal Bridge Report
External wall	E25: Staggered party wall between dwellings	Calculated by person with suitable expertise	0.056	Thermal Bridge Report

3 Air permeability (better than typically expected values are flagged with a subsequent (!))		
Maximum permitted air permeability at 50Pa	*8 m^3/hm^2*	
Dwelling air permeability at 50Pa	5 m^3/hm^2, Measured value	OK
Air permeability test certificate reference		

4 Space heating	
Main heating system 1: Heat pump with radiators or underfloor heating - Electricity	
Efficiency	270.9%
Emitter type	Radiators
Flow temperature	45°C
System type	
Manufacturer	Daikin Europe NV
Model	EDLA09DA3V3
Commissioning	
Secondary heating system: N/A	
Fuel	N/A
Efficiency	N/A
Commissioning	

5 Hot water	
Cylinder/store - type: Cylinder	
Capacity	210 litres
Declared heat loss	1.58 kWh/day
Primary pipework insulated	Yes
Manufacturer	
Model	
Commissioning	
Waste water heat recovery system 1 - type: N/A	
Efficiency	
Manufacturer	
Model	

6 Controls	
Main heating 1 - type: Programmer, room thermostat and TRVs	
Function	
Ecodesign class	
Manufacturer	
Model	

Water heating - type: Cylinder thermostat and HW separately timed	
Manufacturer	
Model	

7 Lighting		
Minimum permitted light source efficacy	*75 lm/W*	
Lowest light source efficacy	80 lm/W	OK
External lights control	N/A	

8 Mechanical ventilation		
System type: Balanced whole-house mechanical ventilation with heat recovery		
Maximum permitted specific fan power	*1.5 W/(l/s)*	
Specific fan power	0.85 W/(l/s)	OK
Minimum permitted heat recovery efficiency	*73%*	
Heat recovery efficiency	90%	OK
Manufacturer/Model	DV110 Adroit	
Commissioning		

9 Local generation
N/A

10 Heat networks
N/A

11 Supporting documentary evidence	
Documentary evidence identified in 11.1 and 11.2 is needed to confirm the data values used for any calculations undertaken, manufacturer declarations made, and tests performed as reflected in this "As built" BREL Compliance Report are correct. 11.1 SAP Conventions, Appendix 1 (documentary evidence) schedules the minimum documentary evidence required. 11.2 Indicative photographic evidence of key stages during construction (guidance within Approved Document L, Volume 1 – Appendix B) that confirms the products identified in this BREL Compliance Report are used in this dwelling, and workmanship is of sufficient quality to support the calculated values claimed in 2a to 2d.	

12 Declarations	
a. Assessor Declaration	
This declaration by the assessor is confirmation that the contents of this BREL Compliance Report are a true and accurate reflection based upon the design and construction information submitted for this dwelling for the purpose of carrying out the assessment, and that the supporting documentary evidence (identified in 11.1 and 11.2) pursuant to Part L of the Building Regulations 2010 (as amended) has been reviewed in the course of preparing this BREL Compliance Report.	
Signed: Name:	Assessor ID: Date:
b. Client Declaration	
This declaration by the client is confirmation that the dwelling has been constructed and completed according to the specifications set out in this BREL Compliance Report, and that photographic evidence of key stages, as described in 11.2, has been provided to the Assessor for this dwelling.	
Signed: Name:	Organisation: Date:

Full SAP Calculation Printout

Property Reference	78449-11	**Issued on Date**	03/10/2025
Assessment Reference	001	**Prop Type Ref**	Mid
Property	836 Rochdale Road, MANCHESTER, M9 8FA		

SAP Rating	84 B	**DER**	3.63	**TER**	11.59
Environmental	97 A	**% DER < TER**			68.68
CO_2 Emissions (t/year)	0.32	**DFEE**	34.22	**TFEE**	37.64
Compliance Check	See BREL	**% DFEE < TFEE**			9.08
% DPER < TPER	36.77	**DPER**	38.42	**TPER**	60.76

Assessor Details	Mr. Daniel Goddard	**Assessor ID**	CP52-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	41.1800 (1b)	x	2.4800 (2b)	=	102.1264	(1b) - (3b)
First floor	49.7800 (1c)	x	2.7800 (2c)	=	138.3884	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	90.9600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	240.5148	(5)

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2. Ventilation rate

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				m3 per hour	
Number of open chimneys			0 * 80 =	0.0000	(6a)
Number of open flues			0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire			0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler			0 * 20 =	0.0000	(6d)
Number of flues attached to other heater			0 * 35 =	0.0000	(6e)
Number of blocked chimneys			0 * 20 =	0.0000	(6f)
Number of intermittent extract fans			0 * 10 =	0.0000	(7a)
Number of passive vents			0 * 10 =	0.0000	(7b)
Number of flueless gas fires			0 * 40 =	0.0000	(7c)
				Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =			0.0000 / (5) =	0.0000	(8)
Pressure test				Yes	
Pressure Test Method				Blower Door	
Measured/design AP50				5.0000	(17)
Infiltration rate				0.2500	(18)
Number of sides sheltered				2	(19)
Shelter factor			(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =	0.2125	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2709	0.2656	0.2603	0.2338	0.2284	0.2019	0.2019	0.1966	0.2125	0.2284	0.2391	0.2497	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	81.0000	(23c)

Effective ac	0.3659	0.3606	0.3553	0.3287	0.3234	0.2969	0.2969	0.2916	0.3075	0.3234	0.3341	0.3447	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door			4.1400	1.0000	4.1400			(26)
Window			8.5100	0.7752	6.5969			(27)
GF			41.1800	0.0900	3.7062	75.0000	3088.5000	(28a)
Exposed Floor			8.6000	0.1400	1.2040	20.0000	172.0000	(28b)
Main	71.8472	12.6500	59.1972	0.1300	7.6956	9.0000	532.7748	(29a)
PIJ	49.7800		49.7800	0.1300	6.4714	9.0000	448.0200	(30)
Total net area of external elements Aum(A, m2)			171.4072					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.8141			(33)
Main dwelling								
Party Wall 1			81.2200	0.0000	0.0000	20.0000	1624.4000	(32)
Timber			96.4800			9.0000	868.3200	(32c)
FF			41.1800			18.0000	741.2400	(32d)
GF			41.1800			9.0000	370.6200	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 7845.8748 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 86.2563 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	8.6300	0.1150	0.9925
E3 Sill	8.6300	0.0170	0.1467
E4 Jamb	28.2000	0.0940	2.6508
E5 Ground floor (normal)	16.6400	0.0670	1.1149
E16 Corner (normal)	4.9600	0.0680	0.3373
E12 Gable (insulation at ceiling level)	11.0000	0.0770	0.8470
E6 Intermediate floor within a dwelling	11.0000	0.0320	0.3520
E17 Corner (inverted - internal area greater than external area)	4.9600	-0.0290	-0.1438
P1 Party wall - Ground floor	12.4600	0.3200	3.9872
E20 Exposed floor (normal)	6.4400	0.0790	0.5088
E21 Exposed floor (inverted)	12.0800	0.0630	0.7610
E18 Party wall between dwellings	11.1200	0.0920	1.0230
P4 Party wall - Roof (insulation at ceiling level)	18.1000	0.1020	1.8462
E25 Staggered party wall between dwellings	9.9200	0.0560	0.5555

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 14.9790 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 44.7932 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	29.0444	28.6228	28.2011	26.0928	25.6712	23.5629	23.5629	23.1413	24.4062	25.6712	26.5145	27.3578	(38)

Heat transfer coeff

	73.8376	73.4159	72.9943	70.8860	70.4644	68.3561	68.3561	67.9345	69.1994	70.4644	71.3077	72.1510	(39)

Average = Sum(39)m / 12 = 70.7806

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8118	0.8071	0.8025	0.7793	0.7747	0.7515	0.7515	0.7469	0.7608	0.7747	0.7839	0.7932	(40)
HLP (average)												0.7782	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6386 (42)
Hot water usage for mixer showers

68.4610	67.4321	65.9329	63.0644	60.9476	58.5869	57.2450	58.7329	60.3639	62.8986	65.8287	68.1987	(42a)

Hot water usage for baths

29.5637	29.1246	28.5063	27.3663	26.5127	25.5661	25.0549	25.6688	26.3373	27.3502	28.5137	29.4637	(42b)

Hot water usage for other uses

41.6522	40.1376	38.6230	37.1084	35.5937	34.0791	34.0791	35.5937	37.1084	38.6230	40.1376	41.6522	(42c)

Average daily hot water use (litres/day) 128.3946 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	139.6769	136.6944	133.0622	127.5391	123.0540	118.2321	116.3790	119.9955	123.8096	128.8717	134.4799	139.3147	(44)
Energy conte	221.2141	194.6510	204.5117	174.5947	165.6543	145.3802	140.7503	148.5795	152.6696	174.8777	191.5913	218.1331	(45)

Energy content (annual) Total = Sum(45)m = 2132.6075
Distribution loss (46)m = 0.15 x (45)m

33.1821	29.1976	30.6768	26.1892	24.8482	21.8070	21.1126	22.2869	22.9004	26.2317	28.7387	32.7200	(46)

Water storage loss:
Store volume 210.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.5800 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.8532 (55)
Total storage loss

26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(56)

If cylinder contains dedicated solar storage

26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

270.9257	239.5518	254.2233	222.7027	215.3659	193.4882	190.4619	198.2911	200.7776	224.5893	239.6993	267.8447	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

270.9257	239.5518	254.2233	222.7027	215.3659	193.4882	190.4619	198.2911	200.7776	224.5893	239.6993	267.8447	(64)

Total per year (kWh/year) = Sum(64)m = 2717.9215 (64)
12Total per year (kWh/year) 2718 (64)
Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)
Heat gains from water heating, kWh/month

113.3230	100.6421	107.7694	96.5391	94.8493	86.8253	86.5688	89.1720	89.2490	97.9161	102.1905	112.2985	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

145.9975	161.6401	145.9975	150.8641	145.9975	150.8641	145.9975	145.9975	150.8641	145.9975	150.8641	145.9975	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

240.8328	243.3319	237.0343	223.6274	206.7036	190.7976	180.1714	177.6723	183.9699	197.3768	214.3007	230.2066	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	(71)

Water heating gains (Table 5)

152.3158	149.7650	144.8514	134.0821	127.4857	120.5907	116.3559	119.8548	123.9570	131.6077	141.9313	150.9389	(72)

Total internal gains

601.7256	617.3165	590.4626	571.1531	542.7662	524.8319	505.1042	506.1041	521.3705	537.5615	569.6755	589.7225	(73)

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6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains

		m2	Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	factor Table 6d	W	
East		4.9800	19.6403	0.3000	0.0000	0.7700	22.5938	(76)
West		3.5300	19.6403	0.3000	0.0000	0.7700	16.0153	(80)

Solar gains	38.6090	75.5274	124.3829	181.4051	222.3188	227.5828	216.6681	186.1147	144.6625	89.6197	48.1409	31.7502	(83)
Total gains	640.3346	692.8439	714.8456	752.5582	765.0850	752.4147	721.7724	692.2188	666.0330	627.1812	617.8164	621.4727	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	29.5163	29.6858	29.8573	30.7453	30.9292	31.8832	31.8832	32.0811	31.4946	30.9292	30.5635	30.2062	
alpha	2.9678	2.9791	2.9905	3.0497	3.0619	3.1255	3.1255	3.1387	3.0996	3.0619	3.0376	3.0137	
util living area	0.9257	0.9043	0.8731	0.7999	0.6927	0.5314	0.4005	0.4303	0.6197	0.8090	0.8948	0.9301	(86)
Living	19.2059	19.4405	19.7783	20.2732	20.6431	20.8917	20.9664	20.9577	20.8146	20.3581	19.7568	19.2090	
Non living	18.5914	18.8234	19.1557	19.6451	19.9905	20.2218	20.2776	20.2761	20.1543	19.7347	19.1505	18.6062	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.0822	19.4405	19.7783	20.2732	20.6431	20.8917	20.9664	20.9577	20.8146	20.3581	19.7568	19.4595	(87)
Th 2	20.2432	20.2472	20.2512	20.2713	20.2753	20.2956	20.2956	20.2996	20.2875	20.2753	20.2673	20.2592	(88)
util rest of house	0.9178	0.8943	0.8594	0.7783	0.6591	0.4833	0.3413	0.3709	0.5731	0.7843	0.8824	0.9227	(89)
MIT 2	19.3982	18.8234	19.1557	19.6451	19.9905	20.2218	20.2776	20.2761	20.1543	19.7347	19.1505	18.8374	(90)
Living area fraction									fLA = Living area / (4) =			0.3196	(91)
MIT	19.6168	19.0206	19.3547	19.8458	20.1991	20.4359	20.4977	20.4939	20.3653	19.9339	19.3443	19.0362	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6168	19.0206	19.3547	19.8458	20.1991	20.4359	20.4977	20.4939	20.3653	19.9339	19.3443	19.0362	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9104	0.8750	0.8406	0.7644	0.6553	0.4932	0.3586	0.3877	0.5784	0.7714	0.8641	0.9082	(94)
Useful gains	582.9793	606.2386	600.8828	575.2925	501.3654	371.0947	258.8479	268.3853	385.2521	483.8220	533.8636	564.4085	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1130.9558	1036.6772	938.3184	775.9072	598.8824	398.9171	266.4323	278.1170	433.5571	657.7081	873.1091	1070.4479	(97)
Space heating kWh	407.6946	289.2547	251.0521	144.4425	72.5527	0.0000	0.0000	0.0000	0.0000	129.3713	244.2568	376.4933	(98a)
Space heating requirement - total per year (kWh/year)												1915.1180	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	407.6946	289.2547	251.0521	144.4425	72.5527	0.0000	0.0000	0.0000	0.0000	129.3713	244.2568	376.4933	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1915.1180	
Space heating per m2											(98c) / (4) =	21.0545	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Efficiency of main space heating system 1 (in %)	270.8847 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	407.6946	289.2547	251.0521	144.4425	72.5527	0.0000	0.0000	0.0000	0.0000	129.3713	244.2568	376.4933	(98)
Space heating efficiency (main heating system 1)	270.8847	270.8847	270.8847	270.8847	0.0000	0.0000	0.0000	0.0000	270.8847	270.8847	270.8847	270.8847	(210)
Space heating fuel (main heating system)	150.5048	106.7815	92.6786	53.3225	26.7836	0.0000	0.0000	0.0000	0.0000	47.7588	90.1700	138.9866	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	270.9257	239.5518	254.2233	222.7027	215.3659	193.4882	190.4619	198.2911	200.7776	224.5893	239.6993	267.8447	(64)
Efficiency of water heater												281.0493	(216)
(217)m	281.0493	281.0493	281.0493	281.0493	281.0493	281.0493	281.0493	281.0493	281.0493	281.0493	281.0493	281.0493	(217)
Fuel for water heating, kWh/month	96.3979	85.2348	90.4551	79.2397	76.6292	68.8449	67.7682	70.5539	71.4386	79.9110	85.2873	95.3017	(219)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	29.6563	26.7864	29.6563	28.6997	29.6563	28.6997	29.6563	29.6563	28.6997	29.6563	28.6997	29.6563	(231)
Lighting	30.8703	24.7653	22.2984	16.3368	12.6190	10.3098	11.5115	14.9631	19.4355	25.5005	28.8027	31.7283	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	706.9864	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	281.0493	
Water heating fuel used	967.0623	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.1900)		
mechanical ventilation fans (SFP = 1.1900)	349.1794	(230a)
Total electricity for the above, kWh/year	349.1794	(231)
Electricity for lighting (calculated in Appendix L)	249.1413	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2272.3695	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	706.9864	0.1552	109.7234	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	967.0623	0.1410	136.3181	(264)
Space and water heating			246.0414	(265)
Pumps, fans and electric keep-hot	349.1794	0.1387	48.4355	(267)
Energy for lighting	249.1413	0.1443	35.9588	(268)
Total CO2, kg/year			330.4357	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.6300	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	706.9864	1.5746	1113.1910	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	967.0623	1.5212	1471.1200	(278)
Space and water heating			2584.3110	(279)
Pumps, fans and electric keep-hot	349.1794	1.5128	528.2386	(281)
Energy for lighting	249.1413	1.5338	382.1413	(282)
Total Primary energy kWh/year			3494.6909	(286)
Dwelling Primary energy Rate (DPER)			38.4200	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	41.1800	(1b)	x 2.4800	(2b) =	102.1264	(1b) - (3b)
First floor	49.7800	(1c)	x 2.7800	(2c) =	138.3884	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	90.9600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		240.5148	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1247	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3747	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3185	(21)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4061	0.3982	0.3902	0.3504	0.3424	0.3026	0.3026	0.2946	0.3185	0.3424	0.3583	0.3743 (22b)
Effective ac	0.5825	0.5793	0.5761	0.5614	0.5586	0.5458	0.5458	0.5434	0.5507	0.5586	0.5642	0.5700 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			4.1400	1.0000	4.1400			(26)
TER Opening Type			8.5100	1.1450	9.7443			(27)
GF			41.1800	0.1300	5.3534			(28a)
Exposed Floor			8.6000	0.1300	1.1180			(28b)
Main	71.8472	12.6500	59.1972	0.1800	10.6555			(29a)
PIJ	49.7800		49.7800	0.1100	5.4758			(30)
Total net area of external elements Aum(A, m2)			171.4072					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	36.4870			(33)
Main dwelling								
Party Wall 1			81.2200	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 86.2563 (35)

List of Thermal Bridges

	Length	Psi-value	Total	
K1 Element				
E2 Other lintels (including other steel lintels)	8.6300	0.0500	0.4315	
E3 Sill	8.6300	0.0500	0.4315	
E4 Jamb	28.2000	0.0500	1.4100	
E5 Ground floor (normal)	16.6400	0.1600	2.6624	
E16 Corner (normal)	4.9600	0.0900	0.4464	
E12 Gable (insulation at ceiling level)	11.0000	0.0600	0.6600	
E6 Intermediate floor within a dwelling	11.0000	0.0000	0.0000	
E17 Corner (inverted - internal area greater than external area)	4.9600	-0.0900	-0.4464	
P1 Party wall - Ground floor	12.4600	0.0800	0.9968	
E20 Exposed floor (normal)	6.4400	0.3200	2.0608	
E21 Exposed floor (inverted)	12.0800	0.3200	3.8656	
E18 Party wall between dwellings	11.1200	0.0600	0.6672	
P4 Party wall - Roof (insulation at ceiling level)	18.1000	0.1200	2.1720	
E25 Staggered party wall between dwellings	9.9200	0.0600	0.5952	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 15.9530 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 52.4400 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	46.2302	45.9760	45.7269	44.5568	44.3378	43.3187	43.3187	43.1299	43.7112	44.3378	44.7807	45.2438	(38)
Heat transfer coeff	98.6702	98.4160	98.1669	96.9967	96.7778	95.7586	95.7586	95.5699	96.1512	96.7778	97.2207	97.6837	(39)
Average = Sum(39)m / 12 =												96.9957	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0848	1.0820	1.0792	1.0664	1.0640	1.0528	1.0528	1.0507	1.0571	1.0640	1.0688	1.0739	(40)
HLP (average)												1.0664	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6386 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	68.4610	67.4321	65.9329	63.0644	60.9476	58.5869	57.2450	58.7329	60.3639	62.8986	65.8287	68.1987	(42a)
Hot water usage for baths	29.5637	29.1246	28.5063	27.3663	26.5127	25.5661	25.0549	25.6688	26.3373	27.3502	28.5137	29.4637	(42b)
Hot water usage for other uses	41.6522	40.1376	38.6230	37.1084	35.5937	34.0791	34.0791	35.5937	37.1084	38.6230	40.1376	41.6522	(42c)
Average daily hot water use (litres/day)												128.3946	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	139.6769	136.6944	133.0622	127.5391	123.0540	118.2321	116.3790	119.9955	123.8096	128.8717	134.4799	139.3147	(44)
Energy conte	221.2141	194.6510	204.5117	174.5947	165.6543	145.3802	140.7503	148.5795	152.6696	174.8777	191.5913	218.1331	(45)
Energy content (annual)										Total = Sum(45)m =		2132.6075	
Distribution loss (46)m = 0.15 x (45)m	33.1821	29.1976	30.6768	26.1892	24.8482	21.8070	21.1126	22.2869	22.9004	26.2317	28.7387	32.7200	(46)
Water storage loss:													
Store volume												210.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7016	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.9188	(55)
Total storage loss	28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842	(56)
If cylinder contains dedicated solar storage	28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	272.9607	241.3898	256.2583	224.6720	217.4009	195.4575	192.4969	200.3261	202.7469	226.6243	241.6687	269.8797	(62)
WWHRS	-31.2975	-27.6798	-28.9847	-24.0004	-22.3675	-19.1401	-17.9408	-19.0782	-19.8031	-23.3456	-26.4477	-30.7179	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	241.6632	213.7101	227.2737	200.6716	195.0334	176.3175	174.5562	181.2479	182.9439	203.2787	215.2209	239.1618	(64)
										Total per year (kWh/year) = Sum(64)m =		2451.0786	(64)
12Total per year (kWh/year)												2451	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	114.9510	102.1125	109.3974	98.1146	96.4773	88.4008	88.1968	90.7999	90.8245	99.5441	103.7660	113.9265	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	142.2156	157.4530	142.2156	146.9561	142.2156	146.9561	142.2156	142.2156	146.9561	142.2156	146.9561	142.2156	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	240.8328	243.3319	237.0343	223.6274	206.7036	190.7976	180.1714	177.6723	183.9699	197.3768	214.3007	230.2066	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	(71)

Water heating gains (Table 5)

	154.5040	151.9532	147.0395	136.2703	129.6738	122.7789	118.5440	122.0429	126.1452	133.7959	144.1194	153.1270	(72)

Total internal gains

	603.1319	618.3176	591.8689	572.4333	544.1725	523.1121	503.5105	504.5103	519.6507	538.9678	570.9557	591.1288	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	4.9800	19.6403	0.6300	0.7000	0.7700	29.8916	(76)
West	3.5300	19.6403	0.6300	0.7000	0.7700	21.1882	(80)

Solar gains	51.0797	99.9228	164.5586	239.9990	294.1277	301.0921	286.6519	246.2298	191.3885	118.5668	63.6904	42.0055	(83)
Total gains	654.2116	718.2404	756.4276	812.4323	838.3003	824.2042	790.1625	750.7401	711.0392	657.5346	634.6461	633.1343	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	22.0878	22.1449	22.2011	22.4689	22.5197	22.7594	22.7594	22.8043	22.6665	22.5197	22.4171	22.3109	
alpha	2.4725	2.4763	2.4801	2.4979	2.5013	2.5173	2.5173	2.5203	2.5111	2.5013	2.4945	2.4874	
util living area	0.9360	0.9177	0.8901	0.8304	0.7393	0.6039	0.4758	0.5113	0.6900	0.8457	0.9133	0.9404	(86)
MIT	18.4055	18.6788	19.1165	19.7406	20.2920	20.7078	20.8849	20.8584	20.5623	19.8623	19.0543	18.3688	(87)
Th 2	20.0133	20.0156	20.0178	20.0284	20.0304	20.0396	20.0396	20.0413	20.0360	20.0304	20.0264	20.0222	(88)
util rest of house	0.9279	0.9074	0.8758	0.8069	0.7003	0.5405	0.3887	0.4252	0.6331	0.8197	0.9008	0.9329	(89)
MIT 2	16.9801	17.3251	17.8765	18.6558	19.3201	19.7941	19.9672	19.9474	19.6441	18.8191	17.8103	16.9389	(90)
Living area fraction									fLA = Living area / (4) =			0.3196	(91)
MIT	17.4357	17.7577	18.2728	19.0025	19.6307	20.0861	20.2605	20.2386	19.9375	19.1525	18.2078	17.3959	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.4357	17.7577	18.2728	19.0025	19.6307	20.0861	20.2605	20.2386	19.9375	19.1525	18.2078	17.3959	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8993	0.8764	0.8434	0.7775	0.6822	0.5438	0.4098	0.4440	0.6266	0.7911	0.8703	0.9053	(94)
Useful gains	588.3189	629.4443	637.9923	631.6314	571.9223	448.2148	323.7839	333.2941	445.5711	520.1449	552.3117	573.1478	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1296.0984	1265.4063	1155.6998	979.9051	767.5179	525.3461	350.5219	366.8520	561.2863	827.6930	1079.9121	1289.0229	(97)
Space heating kWh	526.5880	427.3664	385.1743	250.7571	145.5232	0.0000	0.0000	0.0000	0.0000	228.8158	379.8723	532.6111	(98a)
Space heating requirement - total per year (kWh/year)												2876.7082	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	526.5880	427.3664	385.1743	250.7571	145.5232	0.0000	0.0000	0.0000	228.8158	379.8723	532.6111	(98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												2876.7082	
Space heating per m2											(98c) / (4) =	31.6261	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	526.5880	427.3664	385.1743	250.7571	145.5232	0.0000	0.0000	0.0000	0.0000	228.8158	379.8723	532.6111	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	570.5179	463.0189	417.3070	271.6761	157.6632	0.0000	0.0000	0.0000	0.0000	247.9044	411.5627	577.0434	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	241.6632	213.7101	227.2737	200.6716	195.0334	176.3175	174.5562	181.2479	182.9439	203.2787	215.2209	239.1618	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.7576	85.5823	85.2328	84.5606	83.4125	79.8000	79.8000	79.8000	79.8000	84.3258	85.3199	85.8013	(217)
Fuel for water heating, kWh/month	281.7980	249.7128	266.6504	237.3110	233.8180	220.9492	218.7421	227.1276	229.2530	241.0634	252.2517	278.7391	(219)

Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	29.5496	23.7058	21.3444	15.6378	12.0791	9.8687	11.0190	14.3229	18.6040	24.4095	27.5704	30.3709	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-38.9812	-55.1702	-79.5760	-89.7571	-96.9883	-90.5718	-89.4598	-84.3870	-75.4216	-63.2498	-42.9366	-33.6769	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-21.3144	-44.9402	-89.5251	-134.7575	-178.4789	-179.4591	-177.3409	-150.0006	-109.7478	-64.3537	-28.4842	-16.8460	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	3116.6936	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2937.4164	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	238.4821	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-2035.4247	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	4343.1674	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3116.6936	0.2100	654.5057	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2937.4164	0.2100	616.8574	(264)
Space and water heating			1271.3631	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	238.4821	0.1443	34.4203	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-840.1762	0.1345	-113.0202	
PV Unit electricity exported	-1195.2485	0.1258	-150.3985	
Total			-263.4187	(269)
Total CO2, kg/year			1054.2940	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.5900	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	3116.6936	1.1300	3521.8638	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2937.4164	1.1300	3319.2805	(278)
Space and water heating			6841.1443	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	238.4821	1.5338	365.7919	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-840.1762	1.4972	-1257.8767	
PV Unit electricity exported	-1195.2485	0.4619	-552.0620	
Total			-1809.9387	(283)
Total Primary energy kWh/year			5527.0983	(286)
Target Primary Energy Rate (TPER)			60.7600	(287)

Full SAP Calculation Printout

Property Reference	78449-11	**Issued on Date**	03/10/2025
Assessment Reference	001	**Prop Type Ref**	Mid
Property	836 Rochdale Road, MANCHESTER, M9 8FA		

SAP Rating	84 B	**DER**	3.63	**TER**	11.59
Environmental	97 A	**% DER < TER**			68.68
CO_2 Emissions (t/year)	0.32	**DFEE**	34.22	**TFEE**	37.64
Compliance Check	See BREL	**% DFEE < TFEE**			9.08
% DPER < TPER	36.77	**DPER**	38.42	**TPER**	60.76

Assessor Details	Mr. Daniel Goddard	**Assessor ID**	CP52-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	41.1800 (1b)	x	2.4800 (2b)	=	102.1264	(1b) - (3b)
First floor	49.7800 (1c)	x	2.7800 (2c)	=	138.3884	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	90.9600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	240.5148	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1247	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3747	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3185	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4061	0.3982	0.3902	0.3504	0.3424	0.3026	0.3026	0.2946	0.3185	0.3424	0.3583	0.3743	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0.0000	(23c)

Effective ac	0.5825	0.5793	0.5761	0.5614	0.5586	0.5458	0.5458	0.5434	0.5507	0.5586	0.5642	0.5700	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door			4.1400	1.0000	4.1400			(26)
Window			8.5100	0.7752	6.5969			(27)
GF			41.1800	0.0900	3.7062	75.0000	3088.5000	(28a)
Exposed Floor			8.6000	0.1400	1.2040	20.0000	172.0000	(28b)
Main	71.8472	12.6500	59.1972	0.1300	7.6956	9.0000	532.7748	(29a)
PIJ	49.7800		49.7800	0.1300	6.4714	9.0000	448.0200	(30)
Total net area of external elements Aum(A, m2)			171.4072					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	29.8141			(33)
Main dwelling								
Party Wall 1			81.2200	0.0000	0.0000	20.0000	1624.4000	(32)
Timber			96.4800			9.0000	868.3200	(32c)
FF			41.1800			18.0000	741.2400	(32d)
GF			41.1800			9.0000	370.6200	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	7845.8748 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		86.2563 (35)
List of Thermal Bridges		

	Length	Psi-value	Total	
K1 Element				
E2 Other lintels (including other steel lintels)	8.6300	0.1150	0.9925	
E3 Sill	8.6300	0.0170	0.1467	
E4 Jamb	28.2000	0.0940	2.6508	
E5 Ground floor (normal)	16.6400	0.0670	1.1149	
E16 Corner (normal)	4.9600	0.0680	0.3373	
E12 Gable (insulation at ceiling level)	11.0000	0.0770	0.8470	
E6 Intermediate floor within a dwelling	11.0000	0.0320	0.3520	
E17 Corner (inverted - internal area greater than external area)	4.9600	-0.0290	-0.1438	
P1 Party wall - Ground floor	12.4600	0.3200	3.9872	
E20 Exposed floor (normal)	6.4400	0.0790	0.5088	
E21 Exposed floor (inverted)	12.0800	0.0630	0.7610	
E18 Party wall between dwellings	11.1200	0.0920	1.0230	
P4 Party wall - Roof (insulation at ceiling level)	18.1000	0.1020	1.8462	
E25 Staggered party wall between dwellings	9.9200	0.0560	0.5555	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			14.9790	(36)
Point Thermal bridges		(36a) =	0.0000	
Total fabric heat loss		(33) + (36) + (36a) =	44.7932	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	46.2302	45.9760	45.7269	44.5568	44.3378	43.3187	43.3187	43.1299	43.7112	44.3378	44.7807	45.2438	(38)
Heat transfer coeff	91.0234	90.7692	90.5201	89.3499	89.1310	88.1119	88.1119	87.9231	88.5044	89.1310	89.5739	90.0369	(39)
Average = Sum(39)m / 12 =												89.3489	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0007	0.9979	0.9952	0.9823	0.9799	0.9687	0.9687	0.9666	0.9730	0.9799	0.9848	0.9899	(40)
HLP (average)												0.9823	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Assumed occupancy												2.6386	(42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	29.5637	29.1246	28.5063	27.3663	26.5127	25.5661	25.0549	25.6688	26.3373	27.3502	28.5137	29.4637	(42b)
Hot water usage for other uses	41.6522	40.1376	38.6230	37.1084	35.5937	34.0791	34.0791	35.5937	37.1084	38.6230	40.1376	41.6522	(42c)
Average daily hot water use (litres/day)												65.2759	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	71.2159	69.2622	67.1293	64.4747	62.1064	59.6452	59.1340	61.2626	63.4457	65.9732	68.6513	71.1160	(44)
Energy conte	112.7886	98.6285	103.1753	88.2626	83.6072	73.3408	71.5174	75.8559	78.2349	89.5249	97.8063	111.3504	(45)
Energy content (annual)										Total = Sum(45)m =		1084.0928	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	95.8703	83.8342	87.6990	75.0232	71.0661	62.3397	60.7898	64.4775	66.4996	76.0962	83.1354	94.6479	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	95.8703	83.8342	87.6990	75.0232	71.0661	62.3397	60.7898	64.4775	66.4996	76.0962	83.1354	94.6479	(64)
										Total per year (kWh/year) = Sum(64)m =		921.4789	(64)
12Total per year (kWh/year)												921	(64)
Electric shower(s)	54.8258	48.8503	53.3426	50.9042	51.8594	49.4688	51.1178	51.8594	50.9042	53.3426	52.3396	54.8258	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		623.6406	(64a)
Heat gains from water heating, kWh/month	37.6740	33.1711	35.2604	31.4819	30.7314	27.9521	27.9769	29.0842	29.3510	32.3597	33.8687	37.3684	(65)

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5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	145.9975	161.6401	145.9975	150.8641	145.9975	150.8641	145.9975	145.9975	150.8641	145.9975	150.8641	145.9975	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	240.8328	243.3319	237.0343	223.6274	206.7036	190.7976	180.1714	177.6723	183.9699	197.3768	214.3007	230.2066	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	(71)
Water heating gains (Table 5)	50.6372	49.3618	47.3930	43.7248	41.3056	38.8224	37.6034	39.0917	40.7652	43.4942	47.0399	50.2264	(72)
Total internal gains	500.0470	516.9133	493.0043	480.7957	456.5862	443.0635	426.3517	425.3410	438.1787	449.4480	474.7841	489.0100	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	4.9800	19.6403	0.3000	0.0000	0.7700	22.5938	(76)
West	3.5300	19.6403	0.3000	0.0000	0.7700	16.0153	(80)

Solar gains	38.6090	75.5274	124.3829	181.4051	222.3188	227.5828	216.6681	186.1147	144.6625	89.6197	48.1409	31.7502	(83)
Total gains	538.6560	592.4407	617.3872	662.2009	678.9049	670.6464	643.0199	611.4557	582.8412	539.0677	522.9250	520.7602	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	23.9434	24.0105	24.0765	24.3918	24.4518	24.7346	24.7346	24.7877	24.6249	24.4518	24.3309	24.2057	
alpha	2.5962	2.6007	2.6051	2.6261	2.6301	2.6490	2.6490	2.6525	2.6417	2.6301	2.6221	2.6137	
util living area	0.9553	0.9409	0.9205	0.8713	0.7924	0.6605	0.5285	0.5654	0.7421	0.8831	0.9377	0.9587	(86)
MIT	18.3957	18.6561	19.0682	19.6845	20.2400	20.6826	20.8745	20.8458	20.5334	19.8223	19.0327	18.3640	(87)
Th 2	20.0828	20.0851	20.0874	20.0981	20.1001	20.1095	20.1095	20.1112	20.1059	20.1001	20.0961	20.0918	(88)
util rest of house	0.9496	0.9334	0.9098	0.8526	0.7590	0.6012	0.4423	0.4813	0.6912	0.8625	0.9285	0.9535	(89)
MIT 2	17.6867	17.9450	18.3528	18.9606	19.4904	19.8937	20.0444	20.0272	19.7689	19.1029	18.3273	17.6614	(90)
Living area fraction										fLA = Living area / (4) =		0.3196	(91)
MIT	17.9133	18.1723	18.5814	19.1920	19.7300	20.1459	20.3097	20.2888	20.0132	19.3328	18.5527	17.8859	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.9133	18.1723	18.5814	19.1920	19.7300	20.1459	20.3097	20.2888	20.0132	19.3328	18.5527	17.8859	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9316	0.9130	0.8875	0.8302	0.7434	0.6038	0.4629	0.4993	0.6853	0.8411	0.9082	0.9364	(94)
Useful gains	501.7981	540.8973	547.9198	549.7682	504.6789	404.9694	297.6235	305.2822	399.4211	453.4351	474.9412	487.6325	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1239.1269	1204.7135	1093.6108	919.5872	715.7213	488.6558	326.8695	341.9194	523.3451	778.3676	1025.8637	1232.2388	(97)
Space heating kWh	548.5726	446.0845	405.9941	266.2697	157.0156	0.0000	0.0000	0.0000	0.0000	241.7498	396.6642	553.9871	(98a)
Space heating requirement - total per year (kWh/year)												3016.3375	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	548.5726	446.0845	405.9941	266.2697	157.0156	0.0000	0.0000	0.0000	0.0000	241.7498	396.6642	553.9871	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3016.3375	
Space heating per m2											(98c) / (4) =	33.1611	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	828.2514	652.0277	668.2157	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.6672	0.7409	0.7138	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	552.6268	483.0982	476.9890	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	708.6181	679.8104	645.9957	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	112.3137	146.3539	125.7410	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	28.0784	36.5885	31.4352	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												96.1022	(107)
Energy for space heating												33.1611	(99)
Energy for space cooling												1.0565	(108)
Total												34.2177	(109)
Fabric Energy Efficiency (DFEE)												34.2	(109)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	41.1800	(1b)	x 2.4800	(2b) =	102.1264	(1b) - (3b)
First floor	49.7800	(1c)	x 2.7800	(2c) =	138.3884	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	90.9600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		240.5148	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)

Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1247	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3747	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3185	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													
	0.4061	0.3982	0.3902	0.3504	0.3424	0.3026	0.3026	0.2946	0.3185	0.3424	0.3583	0.3743	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0.0000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5825	0.5793	0.5761	0.5614	0.5586	0.5458	0.5458	0.5434	0.5507	0.5586	0.5642	0.5700	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			4.1400	1.0000	4.1400			(26)
TER Opening Type			8.5100	1.1450	9.7443			(27)
GF			41.1800	0.1300	5.3534			(28a)
Exposed Floor			8.6000	0.1300	1.1180			(28b)
Main	71.8472	12.6500	59.1972	0.1800	10.6555			(29a)
PIJ	49.7800		49.7800	0.1100	5.4758			(30)
Total net area of external elements Aum(A, m2)			171.4072					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	36.4870			(33)
Main dwelling								
Party Wall 1			81.2200	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 86.2563 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	8.6300	0.0500	0.4315
E3 Sill	8.6300	0.0500	0.4315
E4 Jamb	28.2000	0.0500	1.4100
E5 Ground floor (normal)	16.6400	0.1600	2.6624
E16 Corner (normal)	4.9600	0.0900	0.4464
E12 Gable (insulation at ceiling level)	11.0000	0.0600	0.6600
E6 Intermediate floor within a dwelling	11.0000	0.0000	0.0000
E17 Corner (inverted - internal area greater than external area)	4.9600	-0.0900	-0.4464
P1 Party wall - Ground floor	12.4600	0.0800	0.9968
E20 Exposed floor (normal)	6.4400	0.3200	2.0608
E21 Exposed floor (inverted)	12.0800	0.3200	3.8656
E18 Party wall between dwellings	11.1200	0.0600	0.6672
P4 Party wall - Roof (insulation at ceiling level)	18.1000	0.1200	2.1720
E25 Staggered party wall between dwellings	9.9200	0.0600	0.5952

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		15.9530 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	52.4400 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	46.2302	45.9760	45.7269	44.5568	44.3378	43.3187	43.3187	43.1299	43.7112	44.3378	44.7807	45.2438	(38)
Heat transfer coeff													
	98.6702	98.4160	98.1669	96.9967	96.7778	95.7586	95.7586	95.5699	96.1512	96.7778	97.2207	97.6837	(39)
Average = Sum(39)m / 12 =												96.9957	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0848	1.0820	1.0792	1.0664	1.0640	1.0528	1.0528	1.0507	1.0571	1.0640	1.0688	1.0739	(40)
HLP (average)												1.0664	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.6386 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

29.5637	29.1246	28.5063	27.3663	26.5127	25.5661	25.0549	25.6688	26.3373	27.3502	28.5137	29.4637	(42b)

Hot water usage for other uses

41.6522	40.1376	38.6230	37.1084	35.5937	34.0791	34.0791	35.5937	37.1084	38.6230	40.1376	41.6522	(42c)

Average daily hot water use (litres/day)	65.2759 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	71.2159	69.2622	67.1293	64.4747	62.1064	59.6452	59.1340	61.2626	63.4457	65.9732	68.6513	71.1160	(44)
Energy conte	112.7886	98.6285	103.1753	88.2626	83.6072	73.3408	71.5174	75.8559	78.2349	89.5249	97.8063	111.3504	(45)
Energy content (annual)										Total = Sum(45)m =		1084.0928	
Distribution loss (46)m = 0.15 x (45)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	95.8703	83.8342	87.6990	75.0232	71.0661	62.3397	60.7898	64.4775	66.4996	76.0962	83.1354	94.6479	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)

FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	95.8703	83.8342	87.6990	75.0232	71.0661	62.3397	60.7898	64.4775	66.4996	76.0962	83.1354	94.6479	(64)
										Total per year (kWh/year) = Sum(64)m =		921.4789	(64)
12Total per year (kWh/year)												921	(64)
Electric shower(s)	54.8258	48.8503	53.3426	50.9042	51.8594	49.4688	51.1178	51.8594	50.9042	53.3426	52.3396	54.8258	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		623.6406	(64a)
Heat gains from water heating, kWh/month	37.6740	33.1711	35.2604	31.4819	30.7314	27.9521	27.9769	29.0842	29.3510	32.3597	33.8687	37.3684	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	142.2156	157.4530	142.2156	146.9561	142.2156	146.9561	142.2156	142.2156	146.9561	142.2156	146.9561	142.2156	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	240.8328	243.3319	237.0343	223.6274	206.7036	190.7976	180.1714	177.6723	183.9699	197.3768	214.3007	230.2066	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	(71)
Water heating gains (Table 5)	50.6372	49.3618	47.3930	43.7248	41.3056	38.8224	37.6034	39.0917	40.7652	43.4942	47.0399	50.2264	(72)
Total internal gains	496.2651	512.7262	489.2224	476.8878	452.8043	439.1556	422.5699	421.5591	434.2708	445.6662	470.8762	485.2281	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	4.9800	19.6403	0.6300	0.7000	0.7700	29.8916	(76)
West	3.5300	19.6403	0.6300	0.7000	0.7700	21.1882	(80)

Solar gains	51.0797	99.9228	164.5586	239.9990	294.1277	301.0921	286.6519	246.2298	191.3885	118.5668	63.6904	42.0055	(83)
Total gains	547.3448	612.6490	653.7810	716.8868	746.9320	740.2477	709.2218	667.7889	625.6593	564.2330	534.5666	527.2336	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	22.0878	22.1449	22.2011	22.4689	22.5197	22.7594	22.7594	22.8043	22.6665	22.5197	22.4171	22.3109	
alpha	2.4725	2.4763	2.4801	2.4979	2.5013	2.5173	2.5173	2.5203	2.5111	2.5013	2.4945	2.4874	
util living area	0.9553	0.9395	0.9159	0.8618	0.7774	0.6454	0.5167	0.5565	0.7358	0.8810	0.9378	0.9589	(86)
MIT	18.1813	18.4692	18.9293	19.5971	20.1934	20.6573	20.8607	20.8274	20.4857	19.7132	18.8568	18.1428	(87)
Th 2	20.0133	20.0156	20.0178	20.0284	20.0304	20.0396	20.0396	20.0413	20.0360	20.0304	20.0264	20.0222	(88)
util rest of house	0.9493	0.9315	0.9042	0.8412	0.7411	0.5823	0.4257	0.4674	0.6816	0.8592	0.9282	0.9535	(89)
MIT 2	17.4304	17.7155	18.1700	18.8263	19.3922	19.8117	19.9700	19.9503	19.6706	18.9496	18.1090	17.3981	(90)
Living area fraction										fLA = Living area / (4) =		0.3196	(91)
MIT	17.6704	17.9564	18.4127	19.0726	19.6482	20.0820	20.2547	20.2306	19.9311	19.1936	18.3480	17.6361	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.6704	17.9564	18.4127	19.0726	19.6482	20.0820	20.2547	20.2306	19.9311	19.1936	18.3480	17.6361	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9303	0.9095	0.8799	0.8170	0.7248	0.5854	0.4474	0.4863	0.6750	0.8360	0.9066	0.9354	(94)
Useful gains	509.1687	557.2223	575.2474	585.7154	541.3866	433.3140	317.2871	324.7498	422.3123	471.6937	484.6376	493.1838	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1319.2565	1284.9585	1169.4306	986.7115	769.2141	524.9448	349.9653	366.0891	560.6671	831.6736	1093.5350	1312.4905	(97)
Space heating kWh	602.7053	489.0387	442.0723	288.7172	169.5036	0.0000	0.0000	0.0000	0.0000	267.8250	438.4062	609.5642	(98a)
Space heating requirement - total per year (kWh/year)												3307.8326	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	602.7053	489.0387	442.0723	288.7172	169.5036	0.0000	0.0000	0.0000	0.0000	267.8250	438.4062	609.5642	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3307.8326	
Space heating per m2											(98c) / (4) =	36.3658	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	900.1313	708.6140	726.3314	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.6696	0.7408	0.7107	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	602.7506	524.9696	516.1911	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	794.2071	761.2522	715.7953	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	137.8487	175.7942	148.5055	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)

Intermittency factor (Table 10b)

0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)

Space cooling kWh

0.0000	0.0000	0.0000	0.0000	0.0000	34.4622	43.9486	37.1264	0.0000	0.0000	0.0000	0.0000	(107)

Space cooling requirement	115.5371	(107)
Energy for space heating	36.3658	(99)
Energy for space cooling	1.2702	(108)
Total	37.6360	(109)
Fabric Energy Efficiency (TFEE)	37.6	(109)

Full SAP Calculation Printout

Property Reference	78449-11	**Issued on Date**	03/10/2025
Assessment Reference	001	**Prop Type Ref**	Mid
Property	836 Rochdale Road, MANCHESTER, M9 8FA		

SAP Rating	84 B	**DER**	3.63	**TER**	11.59
Environmental	97 A	**% DER < TER**			68.68
CO_2 Emissions (t/year)	0.32	**DFEE**	34.22	**TFEE**	37.64
Compliance Check	See BREL	**% DFEE < TFEE**			9.08
% DPER < TPER	36.77	**DPER**	38.42	**TPER**	60.76

Assessor Details	Mr. Daniel Goddard	**Assessor ID**	CP52-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	41.1800 (1b)	x	2.4800 (2b)	=	102.1264	(1b) - (3b)
First floor	49.7800 (1c)	x	2.7800 (2c)	=	138.3884	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	90.9600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	240.5148	(5)

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2. Ventilation rate

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				m3 per hour	
Number of open chimneys			0 * 80 =	0.0000	(6a)
Number of open flues			0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire			0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler			0 * 20 =	0.0000	(6d)
Number of flues attached to other heater			0 * 35 =	0.0000	(6e)
Number of blocked chimneys			0 * 20 =	0.0000	(6f)
Number of intermittent extract fans			0 * 10 =	0.0000	(7a)
Number of passive vents			0 * 10 =	0.0000	(7b)
Number of flueless gas fires			0 * 40 =	0.0000	(7c)
				Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =			0.0000 / (5) =	0.0000	(8)
Pressure test				Yes	
Pressure Test Method				Blower Door	
Measured/design AP50				5.0000	(17)
Infiltration rate				0.2500	(18)
Number of sides sheltered				2	(19)
Shelter factor			(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =	0.2125	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2709	0.2656	0.2603	0.2338	0.2284	0.2019	0.2019	0.1966	0.2125	0.2284	0.2391	0.2497	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	81.0000	(23c)

Effective ac	0.3659	0.3606	0.3553	0.3287	0.3234	0.2969	0.2969	0.2916	0.3075	0.3234	0.3341	0.3447	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door			4.1400	1.0000	4.1400			(26)
Window			8.5100	0.7752	6.5969			(27)
GF			41.1800	0.0900	3.7062	75.0000	3088.5000	(28a)
Exposed Floor			8.6000	0.1400	1.2040	20.0000	172.0000	(28b)
Main	71.8472	12.6500	59.1972	0.1300	7.6956	9.0000	532.7748	(29a)
PIJ	49.7800		49.7800	0.1300	6.4714	9.0000	448.0200	(30)
Total net area of external elements Aum(A, m2)			171.4072					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.8141			(33)
Main dwelling								
Party Wall 1			81.2200	0.0000	0.0000	20.0000	1624.4000	(32)
Timber			96.4800			9.0000	868.3200	(32c)
FF			41.1800			18.0000	741.2400	(32d)
GF			41.1800			9.0000	370.6200	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 7845.8748 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 86.2563 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	8.6300	0.1150	0.9925
E3 Sill	8.6300	0.0170	0.1467
E4 Jamb	28.2000	0.0940	2.6508
E5 Ground floor (normal)	16.6400	0.0670	1.1149
E16 Corner (normal)	4.9600	0.0680	0.3373
E12 Gable (insulation at ceiling level)	11.0000	0.0770	0.8470
E6 Intermediate floor within a dwelling	11.0000	0.0320	0.3520
E17 Corner (inverted - internal area greater than external area)	4.9600	-0.0290	-0.1438
P1 Party wall - Ground floor	12.4600	0.3200	3.9872
E20 Exposed floor (normal)	6.4400	0.0790	0.5088
E21 Exposed floor (inverted)	12.0800	0.0630	0.7610
E18 Party wall between dwellings	11.1200	0.0920	1.0230
P4 Party wall - Roof (insulation at ceiling level)	18.1000	0.1020	1.8462
E25 Staggered party wall between dwellings	9.9200	0.0560	0.5555

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 14.9790 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 44.7932 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	29.0444	28.6228	28.2011	26.0928	25.6712	23.5629	23.5629	23.1413	24.4062	25.6712	26.5145	27.3578	(38)

Heat transfer coeff

	73.8376	73.4159	72.9943	70.8860	70.4644	68.3561	68.3561	67.9345	69.1994	70.4644	71.3077	72.1510	(39)

Average = Sum(39)m / 12 = 70.7806

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8118	0.8071	0.8025	0.7793	0.7747	0.7515	0.7515	0.7469	0.7608	0.7747	0.7839	0.7932	(40)
HLP (average)												0.7782	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6386 (42)
Hot water usage for mixer showers

68.4610	67.4321	65.9329	63.0644	60.9476	58.5869	57.2450	58.7329	60.3639	62.8986	65.8287	68.1987	(42a)

Hot water usage for baths

29.5637	29.1246	28.5063	27.3663	26.5127	25.5661	25.0549	25.6688	26.3373	27.3502	28.5137	29.4637	(42b)

Hot water usage for other uses

41.6522	40.1376	38.6230	37.1084	35.5937	34.0791	34.0791	35.5937	37.1084	38.6230	40.1376	41.6522	(42c)

Average daily hot water use (litres/day) 128.3946 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	139.6769	136.6944	133.0622	127.5391	123.0540	118.2321	116.3790	119.9955	123.8096	128.8717	134.4799	139.3147	(44)
Energy conte	221.2141	194.6510	204.5117	174.5947	165.6543	145.3802	140.7503	148.5795	152.6696	174.8777	191.5913	218.1331	(45)

Energy content (annual) Total = Sum(45)m = 2132.6075
Distribution loss (46)m = 0.15 x (45)m

33.1821	29.1976	30.6768	26.1892	24.8482	21.8070	21.1126	22.2869	22.9004	26.2317	28.7387	32.7200	(46)

Water storage loss:
Store volume 210.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.5800 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.8532 (55)
Total storage loss

26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(56)

If cylinder contains dedicated solar storage

26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

270.9257	239.5518	254.2233	222.7027	215.3659	193.4882	190.4619	198.2911	200.7776	224.5893	239.6993	267.8447	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

270.9257	239.5518	254.2233	222.7027	215.3659	193.4882	190.4619	198.2911	200.7776	224.5893	239.6993	267.8447	(64)

Total per year (kWh/year) = Sum(64)m = 2717.9215 (64)
12Total per year (kWh/year) 2718 (64)
Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)
Heat gains from water heating, kWh/month

113.3230	100.6421	107.7694	96.5391	94.8493	86.8253	86.5688	89.1720	89.2490	97.9161	102.1905	112.2985	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

145.9975	161.6401	145.9975	150.8641	145.9975	150.8641	145.9975	145.9975	150.8641	145.9975	150.8641	145.9975	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

240.8328	243.3319	237.0343	223.6274	206.7036	190.7976	180.1714	177.6723	183.9699	197.3768	214.3007	230.2066	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	(71)

Water heating gains (Table 5)

152.3158	149.7650	144.8514	134.0821	127.4857	120.5907	116.3559	119.8548	123.9570	131.6077	141.9313	150.9389	(72)

Total internal gains

601.7256	617.3165	590.4626	571.1531	542.7662	524.8319	505.1042	506.1041	521.3705	537.5615	569.6755	589.7225	(73)

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6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains

		m2	Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	factor Table 6d	W	
East		4.9800	19.6403	0.3000	0.0000	0.7700	22.5938	(76)
West		3.5300	19.6403	0.3000	0.0000	0.7700	16.0153	(80)

Solar gains	38.6090	75.5274	124.3829	181.4051	222.3188	227.5828	216.6681	186.1147	144.6625	89.6197	48.1409	31.7502	(83)
Total gains	640.3346	692.8439	714.8456	752.5582	765.0850	752.4147	721.7724	692.2188	666.0330	627.1812	617.8164	621.4727	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	29.5163	29.6858	29.8573	30.7453	30.9292	31.8832	31.8832	32.0811	31.4946	30.9292	30.5635	30.2062	
alpha	2.9678	2.9791	2.9905	3.0497	3.0619	3.1255	3.1255	3.1387	3.0996	3.0619	3.0376	3.0137	
util living area	0.9257	0.9043	0.8731	0.7999	0.6927	0.5314	0.4005	0.4303	0.6197	0.8090	0.8948	0.9301	(86)
Living	19.2059	19.4405	19.7783	20.2732	20.6431	20.8917	20.9664	20.9577	20.8146	20.3581	19.7568	19.2090	
Non living	18.5914	18.8234	19.1557	19.6451	19.9905	20.2218	20.2776	20.2761	20.1543	19.7347	19.1505	18.6062	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.0822	19.4405	19.7783	20.2732	20.6431	20.8917	20.9664	20.9577	20.8146	20.3581	19.7568	19.4595	(87)
Th 2	20.2432	20.2472	20.2512	20.2713	20.2753	20.2956	20.2956	20.2996	20.2875	20.2753	20.2673	20.2592	(88)
util rest of house	0.9178	0.8943	0.8594	0.7783	0.6591	0.4833	0.3413	0.3709	0.5731	0.7843	0.8824	0.9227	(89)
MIT 2	19.3982	18.8234	19.1557	19.6451	19.9905	20.2218	20.2776	20.2761	20.1543	19.7347	19.1505	18.8374	(90)
Living area fraction									fLA = Living area / (4) =			0.3196	(91)
MIT	19.6168	19.0206	19.3547	19.8458	20.1991	20.4359	20.4977	20.4939	20.3653	19.9339	19.3443	19.0362	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6168	19.0206	19.3547	19.8458	20.1991	20.4359	20.4977	20.4939	20.3653	19.9339	19.3443	19.0362	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9104	0.8750	0.8406	0.7644	0.6553	0.4932	0.3586	0.3877	0.5784	0.7714	0.8641	0.9082	(94)
Useful gains	582.9793	606.2386	600.8828	575.2925	501.3654	371.0947	258.8479	268.3853	385.2521	483.8220	533.8636	564.4085	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1130.9558	1036.6772	938.3184	775.9072	598.8824	398.9171	266.4323	278.1170	433.5571	657.7081	873.1091	1070.4479	(97)
Space heating kWh	407.6946	289.2547	251.0521	144.4425	72.5527	0.0000	0.0000	0.0000	0.0000	129.3713	244.2568	376.4933	(98a)
Space heating requirement - total per year (kWh/year)												1915.1180	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	407.6946	289.2547	251.0521	144.4425	72.5527	0.0000	0.0000	0.0000	0.0000	129.3713	244.2568	376.4933	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1915.1180	
Space heating per m2											(98c) / (4) =	21.0545	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Efficiency of main space heating system 1 (in %)	270.8847 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	407.6946	289.2547	251.0521	144.4425	72.5527	0.0000	0.0000	0.0000	0.0000	129.3713	244.2568	376.4933	(98)
Space heating efficiency (main heating system 1)	270.8847	270.8847	270.8847	270.8847	0.0000	0.0000	0.0000	0.0000	270.8847	270.8847	270.8847	270.8847	(210)
Space heating fuel (main heating system)	150.5048	106.7815	92.6786	53.3225	26.7836	0.0000	0.0000	0.0000	0.0000	47.7588	90.1700	138.9866	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	270.9257	239.5518	254.2233	222.7027	215.3659	193.4882	190.4619	198.2911	200.7776	224.5893	239.6993	267.8447	(64)
Efficiency of water heater												281.0493	(216)
(217)m	281.0493	281.0493	281.0493	281.0493	281.0493	281.0493	281.0493	281.0493	281.0493	281.0493	281.0493	281.0493	(217)
Fuel for water heating, kWh/month	96.3979	85.2348	90.4551	79.2397	76.6292	68.8449	67.7682	70.5539	71.4386	79.9110	85.2873	95.3017	(219)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	29.6563	26.7864	29.6563	28.6997	29.6563	28.6997	29.6563	29.6563	28.6997	29.6563	28.6997	29.6563	(231)
Lighting	30.8703	24.7653	22.2984	16.3368	12.6190	10.3098	11.5115	14.9631	19.4355	25.5005	28.8027	31.7283	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	706.9864	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	281.0493	
Water heating fuel used	967.0623	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.1900)		
mechanical ventilation fans (SFP = 1.1900)	349.1794	(230a)
Total electricity for the above, kWh/year	349.1794	(231)
Electricity for lighting (calculated in Appendix L)	249.1413	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2272.3695	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	706.9864	0.1552	109.7234	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	967.0623	0.1410	136.3181	(264)
Space and water heating			246.0414	(265)
Pumps, fans and electric keep-hot	349.1794	0.1387	48.4355	(267)
Energy for lighting	249.1413	0.1443	35.9588	(268)
Total CO2, kg/year			330.4357	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.6300	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	706.9864	1.5746	1113.1910	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	967.0623	1.5212	1471.1200	(278)
Space and water heating			2584.3110	(279)
Pumps, fans and electric keep-hot	349.1794	1.5128	528.2386	(281)
Energy for lighting	249.1413	1.5338	382.1413	(282)
Total Primary energy kWh/year			3494.6909	(286)
Dwelling Primary energy Rate (DPER)			38.4200	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	41.1800	(1b)	x 2.4800	(2b) =	102.1264	(1b) - (3b)
First floor	49.7800	(1c)	x 2.7800	(2c) =	138.3884	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	90.9600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		240.5148	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1247	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3747	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3185	(21)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4061	0.3982	0.3902	0.3504	0.3424	0.3026	0.3026	0.2946	0.3185	0.3424	0.3583	0.3743 (22b)
Effective ac	0.5825	0.5793	0.5761	0.5614	0.5586	0.5458	0.5458	0.5434	0.5507	0.5586	0.5642	0.5700 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			4.1400	1.0000	4.1400			(26)
TER Opening Type			8.5100	1.1450	9.7443			(27)
GF			41.1800	0.1300	5.3534			(28a)
Exposed Floor			8.6000	0.1300	1.1180			(28b)
Main	71.8472	12.6500	59.1972	0.1800	10.6555			(29a)
PIJ	49.7800		49.7800	0.1100	5.4758			(30)
Total net area of external elements Aum(A, m2)			171.4072					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	36.4870			(33)
Main dwelling								
Party Wall 1			81.2200	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 86.2563 (35)

List of Thermal Bridges

	Length	Psi-value	Total	
K1 Element				
E2 Other lintels (including other steel lintels)	8.6300	0.0500	0.4315	
E3 Sill	8.6300	0.0500	0.4315	
E4 Jamb	28.2000	0.0500	1.4100	
E5 Ground floor (normal)	16.6400	0.1600	2.6624	
E16 Corner (normal)	4.9600	0.0900	0.4464	
E12 Gable (insulation at ceiling level)	11.0000	0.0600	0.6600	
E6 Intermediate floor within a dwelling	11.0000	0.0000	0.0000	
E17 Corner (inverted - internal area greater than external area)	4.9600	-0.0900	-0.4464	
P1 Party wall - Ground floor	12.4600	0.0800	0.9968	
E20 Exposed floor (normal)	6.4400	0.3200	2.0608	
E21 Exposed floor (inverted)	12.0800	0.3200	3.8656	
E18 Party wall between dwellings	11.1200	0.0600	0.6672	
P4 Party wall - Roof (insulation at ceiling level)	18.1000	0.1200	2.1720	
E25 Staggered party wall between dwellings	9.9200	0.0600	0.5952	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 15.9530 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 52.4400 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	46.2302	45.9760	45.7269	44.5568	44.3378	43.3187	43.3187	43.1299	43.7112	44.3378	44.7807	45.2438	(38)
Heat transfer coeff	98.6702	98.4160	98.1669	96.9967	96.7778	95.7586	95.7586	95.5699	96.1512	96.7778	97.2207	97.6837	(39)
Average = Sum(39)m / 12 =												96.9957	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0848	1.0820	1.0792	1.0664	1.0640	1.0528	1.0528	1.0507	1.0571	1.0640	1.0688	1.0739	(40)
HLP (average)												1.0664	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6386 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	68.4610	67.4321	65.9329	63.0644	60.9476	58.5869	57.2450	58.7329	60.3639	62.8986	65.8287	68.1987	(42a)
Hot water usage for baths	29.5637	29.1246	28.5063	27.3663	26.5127	25.5661	25.0549	25.6688	26.3373	27.3502	28.5137	29.4637	(42b)
Hot water usage for other uses	41.6522	40.1376	38.6230	37.1084	35.5937	34.0791	34.0791	35.5937	37.1084	38.6230	40.1376	41.6522	(42c)
Average daily hot water use (litres/day)												128.3946	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	139.6769	136.6944	133.0622	127.5391	123.0540	118.2321	116.3790	119.9955	123.8096	128.8717	134.4799	139.3147	(44)
Energy conte	221.2141	194.6510	204.5117	174.5947	165.6543	145.3802	140.7503	148.5795	152.6696	174.8777	191.5913	218.1331	(45)
Energy content (annual)										Total = Sum(45)m =		2132.6075	
Distribution loss (46)m = 0.15 x (45)m	33.1821	29.1976	30.6768	26.1892	24.8482	21.8070	21.1126	22.2869	22.9004	26.2317	28.7387	32.7200	(46)
Water storage loss:													
Store volume												210.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7016	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.9188	(55)
Total storage loss	28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842	(56)
If cylinder contains dedicated solar storage	28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	272.9607	241.3898	256.2583	224.6720	217.4009	195.4575	192.4969	200.3261	202.7469	226.6243	241.6687	269.8797	(62)
WWHRS	-31.2975	-27.6798	-28.9847	-24.0004	-22.3675	-19.1401	-17.9408	-19.0782	-19.8031	-23.3456	-26.4477	-30.7179	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	241.6632	213.7101	227.2737	200.6716	195.0334	176.3175	174.5562	181.2479	182.9439	203.2787	215.2209	239.1618	(64)
										Total per year (kWh/year) = Sum(64)m =		2451.0786	(64)
12Total per year (kWh/year)												2451	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	114.9510	102.1125	109.3974	98.1146	96.4773	88.4008	88.1968	90.7999	90.8245	99.5441	103.7660	113.9265	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	142.2156	157.4530	142.2156	146.9561	142.2156	146.9561	142.2156	142.2156	146.9561	142.2156	146.9561	142.2156	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	240.8328	243.3319	237.0343	223.6274	206.7036	190.7976	180.1714	177.6723	183.9699	197.3768	214.3007	230.2066	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	(71)

Water heating gains (Table 5)

	154.5040	151.9532	147.0395	136.2703	129.6738	122.7789	118.5440	122.0429	126.1452	133.7959	144.1194	153.1270	(72)

Total internal gains

	603.1319	618.3176	591.8689	572.4333	544.1725	523.1121	503.5105	504.5103	519.6507	538.9678	570.9557	591.1288	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	4.9800	19.6403	0.6300	0.7000	0.7700	29.8916	(76)
West	3.5300	19.6403	0.6300	0.7000	0.7700	21.1882	(80)

Solar gains	51.0797	99.9228	164.5586	239.9990	294.1277	301.0921	286.6519	246.2298	191.3885	118.5668	63.6904	42.0055	(83)
Total gains	654.2116	718.2404	756.4276	812.4323	838.3003	824.2042	790.1625	750.7401	711.0392	657.5346	634.6461	633.1343	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	22.0878	22.1449	22.2011	22.4689	22.5197	22.7594	22.7594	22.8043	22.6665	22.5197	22.4171	22.3109	
alpha	2.4725	2.4763	2.4801	2.4979	2.5013	2.5173	2.5173	2.5203	2.5111	2.5013	2.4945	2.4874	
util living area	0.9360	0.9177	0.8901	0.8304	0.7393	0.6039	0.4758	0.5113	0.6900	0.8457	0.9133	0.9404	(86)
MIT	18.4055	18.6788	19.1165	19.7406	20.2920	20.7078	20.8849	20.8584	20.5623	19.8623	19.0543	18.3688	(87)
Th 2	20.0133	20.0156	20.0178	20.0284	20.0304	20.0396	20.0396	20.0413	20.0360	20.0304	20.0264	20.0222	(88)
util rest of house	0.9279	0.9074	0.8758	0.8069	0.7003	0.5405	0.3887	0.4252	0.6331	0.8197	0.9008	0.9329	(89)
MIT 2	16.9801	17.3251	17.8765	18.6558	19.3201	19.7941	19.9672	19.9474	19.6441	18.8191	17.8103	16.9389	(90)
Living area fraction									fLA = Living area / (4) =			0.3196	(91)
MIT	17.4357	17.7577	18.2728	19.0025	19.6307	20.0861	20.2605	20.2386	19.9375	19.1525	18.2078	17.3959	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.4357	17.7577	18.2728	19.0025	19.6307	20.0861	20.2605	20.2386	19.9375	19.1525	18.2078	17.3959	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8993	0.8764	0.8434	0.7775	0.6822	0.5438	0.4098	0.4440	0.6266	0.7911	0.8703	0.9053	(94)
Useful gains	588.3189	629.4443	637.9923	631.6314	571.9223	448.2148	323.7839	333.2941	445.5711	520.1449	552.3117	573.1478	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1296.0984	1265.4063	1155.6998	979.9051	767.5179	525.3461	350.5219	366.8520	561.2863	827.6930	1079.9121	1289.0229	(97)
Space heating kWh	526.5880	427.3664	385.1743	250.7571	145.5232	0.0000	0.0000	0.0000	0.0000	228.8158	379.8723	532.6111	(98a)
Space heating requirement - total per year (kWh/year)												2876.7082	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	526.5880	427.3664	385.1743	250.7571	145.5232	0.0000	0.0000	0.0000	228.8158	379.8723	532.6111	(98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												2876.7082	
Space heating per m2											(98c) / (4) =	31.6261	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	526.5880	427.3664	385.1743	250.7571	145.5232	0.0000	0.0000	0.0000	0.0000	228.8158	379.8723	532.6111	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	570.5179	463.0189	417.3070	271.6761	157.6632	0.0000	0.0000	0.0000	0.0000	247.9044	411.5627	577.0434	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	241.6632	213.7101	227.2737	200.6716	195.0334	176.3175	174.5562	181.2479	182.9439	203.2787	215.2209	239.1618	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.7576	85.5823	85.2328	84.5606	83.4125	79.8000	79.8000	79.8000	79.8000	84.3258	85.3199	85.8013	(217)
Fuel for water heating, kWh/month	281.7980	249.7128	266.6504	237.3110	233.8180	220.9492	218.7421	227.1276	229.2530	241.0634	252.2517	278.7391	(219)

Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	29.5496	23.7058	21.3444	15.6378	12.0791	9.8687	11.0190	14.3229	18.6040	24.4095	27.5704	30.3709	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-38.9812	-55.1702	-79.5760	-89.7571	-96.9883	-90.5718	-89.4598	-84.3870	-75.4216	-63.2498	-42.9366	-33.6769	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-21.3144	-44.9402	-89.5251	-134.7575	-178.4789	-179.4591	-177.3409	-150.0006	-109.7478	-64.3537	-28.4842	-16.8460	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	3116.6936	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2937.4164	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	238.4821	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-2035.4247	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	4343.1674	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3116.6936	0.2100	654.5057	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2937.4164	0.2100	616.8574	(264)
Space and water heating			1271.3631	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	238.4821	0.1443	34.4203	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-840.1762	0.1345	-113.0202	
PV Unit electricity exported	-1195.2485	0.1258	-150.3985	
Total			-263.4187	(269)
Total CO2, kg/year			1054.2940	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.5900	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	3116.6936	1.1300	3521.8638	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2937.4164	1.1300	3319.2805	(278)
Space and water heating			6841.1443	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	238.4821	1.5338	365.7919	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-840.1762	1.4972	-1257.8767	
PV Unit electricity exported	-1195.2485	0.4619	-552.0620	
Total			-1809.9387	(283)
Total Primary energy kWh/year			5527.0983	(286)
Target Primary Energy Rate (TPER)			60.7600	(287)

Full SAP Calculation Printout

Property Reference	78449-11	**Issued on Date**	03/10/2025
Assessment Reference	001	**Prop Type Ref**	Mid
Property	836 Rochdale Road, MANCHESTER, M9 8FA		

SAP Rating	84 B	**DER**	3.63	**TER**	11.59
Environmental	97 A	**% DER < TER**			68.68
CO_2 Emissions (t/year)	0.32	**DFEE**	34.22	**TFEE**	37.64
Compliance Check	See BREL	**% DFEE < TFEE**			9.08
% DPER < TPER	36.77	**DPER**	38.42	**TPER**	60.76

Assessor Details	Mr. Daniel Goddard	**Assessor ID**	CP52-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	41.1800	(1b)	x 2.4800	(2b) =	102.1264	(1b) - (3b)
First floor	49.7800	(1c)	x 2.7800	(2c) =	138.3884	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	90.9600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		240.5148	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.2500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2125	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2709	0.2656	0.2603	0.2338	0.2284	0.2019	0.2019	0.1966	0.2125	0.2284	0.2391	0.2497	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	81.0000	(23c)

Effective ac	0.3659	0.3606	0.3553	0.3287	0.3234	0.2969	0.2969	0.2916	0.3075	0.3234	0.3341	0.3447	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door			4.1400	1.0000	4.1400			(26)
Window			8.5100	0.7752	6.5969			(27)
GF			41.1800	0.0900	3.7062	75.0000	3088.5000	(28a)
Exposed Floor			8.6000	0.1400	1.2040	20.0000	172.0000	(28b)
Main	71.8472	12.6500	59.1972	0.1300	7.6956	9.0000	532.7748	(29a)
PIJ	49.7800		49.7800	0.1300	6.4714	9.0000	448.0200	(30)
Total net area of external elements Aum(A, m2)			171.4072					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.8141			(33)
Main dwelling								
Party Wall 1			81.2200	0.0000	0.0000	20.0000	1624.4000	(32)
Timber			96.4800			9.0000	868.3200	(32c)
FF			41.1800			18.0000	741.2400	(32d)
GF			41.1800			9.0000	370.6200	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 7845.8748 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 86.2563 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	8.6300	0.1150	0.9925
E3 Sill	8.6300	0.0170	0.1467
E4 Jamb	28.2000	0.0940	2.6508
E5 Ground floor (normal)	16.6400	0.0670	1.1149
E16 Corner (normal)	4.9600	0.0680	0.3373
E12 Gable (insulation at ceiling level)	11.0000	0.0770	0.8470
E6 Intermediate floor within a dwelling	11.0000	0.0320	0.3520
E17 Corner (inverted - internal area greater than external area)	4.9600	-0.0290	-0.1438
P1 Party wall - Ground floor	12.4600	0.3200	3.9872
E20 Exposed floor (normal)	6.4400	0.0790	0.5088
E21 Exposed floor (inverted)	12.0800	0.0630	0.7610
E18 Party wall between dwellings	11.1200	0.0920	1.0230
P4 Party wall - Roof (insulation at ceiling level)	18.1000	0.1020	1.8462
E25 Staggered party wall between dwellings	9.9200	0.0560	0.5555

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 14.9790 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 44.7932 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	29.0444	28.6228	28.2011	26.0928	25.6712	23.5629	23.5629	23.1413	24.4062	25.6712	26.5145	27.3578	(38)
Heat transfer coeff	73.8376	73.4159	72.9943	70.8860	70.4644	68.3561	68.3561	67.9345	69.1994	70.4644	71.3077	72.1510	(39)
Average = Sum(39)m / 12 =												70.7806	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8118	0.8071	0.8025	0.7793	0.7747	0.7515	0.7515	0.7469	0.7608	0.7747	0.7839	0.7932	(40)
HLP (average)												0.7782	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6386 (42)
Hot water usage for mixer showers

68.4610	67.4321	65.9329	63.0644	60.9476	58.5869	57.2450	58.7329	60.3639	62.8986	65.8287	68.1987	(42a)

Hot water usage for baths

29.5637	29.1246	28.5063	27.3663	26.5127	25.5661	25.0549	25.6688	26.3373	27.3502	28.5137	29.4637	(42b)

Hot water usage for other uses

41.6522	40.1376	38.6230	37.1084	35.5937	34.0791	34.0791	35.5937	37.1084	38.6230	40.1376	41.6522	(42c)

Average daily hot water use (litres/day) 128.3946 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	139.6769	136.6944	133.0622	127.5391	123.0540	118.2321	116.3790	119.9955	123.8096	128.8717	134.4799	139.3147	(44)
Energy conte	221.2141	194.6510	204.5117	174.5947	165.6543	145.3802	140.7503	148.5795	152.6696	174.8777	191.5913	218.1331	(45)
Energy content (annual)										Total = Sum(45)m =		2132.6075	
Distribution loss (46)m = 0.15 x (45)m	33.1821	29.1976	30.6768	26.1892	24.8482	21.8070	21.1126	22.2869	22.9004	26.2317	28.7387	32.7200	(46)
Water storage loss:													
Store volume												210.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5800	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8532	(55)
Total storage loss	26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(56)
If cylinder contains dedicated solar storage	26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	270.9257	239.5518	254.2233	222.7027	215.3659	193.4882	190.4619	198.2911	200.7776	224.5893	239.6993	267.8447	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	270.9257	239.5518	254.2233	222.7027	215.3659	193.4882	190.4619	198.2911	200.7776	224.5893	239.6993	267.8447	(64)
										Total per year (kWh/year) = Sum(64)m =		2717.9215	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	113.3230	100.6421	107.7694	96.5391	94.8493	86.8253	86.5688	89.1720	89.2490	97.9161	102.1905	112.2985	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	35.2685	31.3252	25.4754	19.2865	14.4169	12.1713	13.1516	17.0949	22.9447	29.1336	34.0032	36.2488	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	359.4520	363.1820	353.7825	333.7722	308.5128	284.7725	268.9125	265.1825	274.5820	294.5923	319.8517	343.5920	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	(71)
Water heating gains (Table 5)	152.3158	149.7650	144.8514	134.0821	127.4857	120.5907	116.3559	119.8548	123.9570	131.6077	141.9313	150.9389	(72)
Total internal gains	653.2794	650.5153	630.3524	593.3839	556.6585	523.7777	504.6631	508.3753	527.7268	561.5767	602.0293	637.0228	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a	g Specific data	FF Specific data	Access factor	Gains W

					W/m2	or Table 6b		or Table 6c		Table 6d			
East					4.9800	19.6403		0.3000		0.0000	0.7700	22.5938	(76)
West					3.5300	19.6403		0.3000		0.0000	0.7700	16.0153	(80)
Solar gains	38.6090	75.5274	124.3829	181.4051	222.3188	227.5828	216.6681	186.1147	144.6625	89.6197	48.1409	31.7502	(83)
Total gains	691.8885	726.0427	754.7353	774.7891	778.9772	751.3605	721.3312	694.4900	672.3893	651.1964	650.1702	668.7729	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	29.5163	29.6858	29.8573	30.7453	30.9292	31.8832	31.8832	32.0811	31.4946	30.9292	30.5635	30.2062	
alpha	2.9678	2.9791	2.9905	3.0497	3.0619	3.1255	3.1255	3.1387	3.0996	3.0619	3.0376	3.0137	
util living area	0.9121	0.8945	0.8591	0.7899	0.6853	0.5320	0.4007	0.4290	0.6157	0.7964	0.8831	0.9178	(86)
Living	19.3133	19.5049	19.8465	20.3018	20.6541	20.8914	20.9663	20.9580	20.8180	20.3899	19.8174	19.3099	
Non living	18.6955	18.8852	19.2202	19.6711	19.9998	20.2215	20.2775	20.2763	20.1570	19.7633	19.2082	18.7041	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.1371	19.5049	19.8465	20.3018	20.6541	20.8914	20.9663	20.9580	20.8180	20.3899	19.8174	19.5463	(87)
Th 2	20.2432	20.2472	20.2512	20.2713	20.2753	20.2956	20.2956	20.2996	20.2875	20.2753	20.2673	20.2592	(88)
util rest of house	0.9031	0.8837	0.8444	0.7678	0.6515	0.4839	0.3415	0.3698	0.5690	0.7708	0.8697	0.9093	(89)
MIT 2	19.4514	18.8852	19.2202	19.6711	19.9998	20.2215	20.2775	20.2763	20.1570	19.7633	19.2082	18.9216	(90)
Living area fraction									fLA = Living area / (4) =			0.3196	(91)
MIT	19.6706	19.0833	19.4203	19.8726	20.2089	20.4356	20.4977	20.4941	20.3682	19.9636	19.4029	19.1213	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6706	19.0833	19.4203	19.8726	20.2089	20.4356	20.4977	20.4941	20.3682	19.9636	19.4029	19.1213	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8955	0.8643	0.8258	0.7545	0.6482	0.4938	0.3588	0.3866	0.5746	0.7587	0.8515	0.8941	(94)
Useful gains	619.5576	627.4984	623.2848	584.6008	504.9435	370.9896	258.8336	268.4813	386.3351	494.0863	553.6206	597.9674	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1134.9258	1041.2778	943.1111	777.8068	599.5755	398.8983	266.4298	278.1337	433.7576	659.7981	877.2884	1076.5852	(97)
Space heating kWh	383.4339	278.0598	237.9508	139.1083	70.4062	0.0000	0.0000	0.0000	0.0000	123.2896	233.0408	356.0916	(98a)
Space heating requirement - total per year (kWh/year)												1821.3810	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	383.4339	278.0598	237.9508	139.1083	70.4062	0.0000	0.0000	0.0000	0.0000	123.2896	233.0408	356.0916	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1821.3810	
Space heating per m2										(98c) / (4) =		20.0240	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	270.8847	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	383.4339	278.0598	237.9508	139.1083	70.4062	0.0000	0.0000	0.0000	0.0000	123.2896	233.0408	356.0916	(98)
Space heating efficiency (main heating system 1)	270.8847	270.8847	270.8847	270.8847	270.8847	0.0000	0.0000	0.0000	0.0000	270.8847	270.8847	270.8847	(210)
Space heating fuel (main heating system)	141.5488	102.6488	87.8421	51.3533	25.9912	0.0000	0.0000	0.0000	0.0000	45.5137	86.0295	131.4551	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	270.9257	239.5518	254.2233	222.7027	215.3659	193.4882	190.4619	198.2911	200.7776	224.5893	239.6993	267.8447	(64)
Efficiency of water heater												281.0493	(216)
(217)m	281.0493	281.0493	281.0493	281.0493	281.0493	281.0493	281.0493	281.0493	281.0493	281.0493	281.0493	281.0493	(217)
Fuel for water heating, kWh/month	96.3979	85.2348	90.4551	79.2397	76.6292	68.8449	67.7682	70.5539	71.4386	79.9110	85.2873	95.3017	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	29.6563	26.7864	29.6563	28.6997	29.6563	28.6997	29.6563	29.6563	28.6997	29.6563	28.6997	29.6563	(231)
Lighting	30.8703	24.7653	22.2984	16.3368	12.6190	10.3098	11.5115	14.9631	19.4355	25.5005	28.8027	31.7283	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	672.3824	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	281.0493	
Water heating fuel used	967.0623	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.1900)		
mechanical ventilation fans (SFP = 1.1900)	349.1794	(230a)
Total electricity for the above, kWh/year	349.1794	(231)
Electricity for lighting (calculated in Appendix L)	249.1413	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2237.7655	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	672.3824	16.4900	110.8759	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	967.0623	16.4900	159.4686	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	349.1794	16.4900	57.5797	(249)
Energy for lighting	249.1413	16.4900	41.0834	(250)
Additional standing charges			0.0000	(251)
Total energy cost			369.0075	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.9771	(257)
SAP value		84.1617	
SAP rating (Section 12)		84	(258)
SAP band		B	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	672.3824	0.1551	104.3180	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	967.0623	0.1410	136.3181	(264)
Space and water heating			240.6360	(265)
Pumps, fans and electric keep-hot	349.1794	0.1387	48.4355	(267)
Energy for lighting	249.1413	0.1443	35.9588	(268)
Total CO2, kg/year			325.0303	(272)
CO2 emissions per m2			3.5700	(273)
EI value			96.7966	
EI rating			97	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	41.1800 (1b)	x	2.4800 (2b)	=	102.1264	(1b) - (3b)
First floor	49.7800 (1c)	x	2.7800 (2c)	=	138.3884	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 90.9600						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	240.5148	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.2500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2125	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.6000	4.5000	4.5000	4.1000	4.2000	3.7000	3.5000	3.5000	3.7000	4.1000	4.1000	4.2000	(22)
Wind factor	1.1500	1.1250	1.1250	1.0250	1.0500	0.9250	0.8750	0.8750	0.9250	1.0250	1.0250	1.0500	(22a)
Adj infilt rate													
	0.2444	0.2391	0.2391	0.2178	0.2231	0.1966	0.1859	0.1859	0.1966	0.2178	0.2178	0.2231	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	81.0000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.3394	0.3341	0.3341	0.3128	0.3181	0.2916	0.2809	0.2809	0.2916	0.3128	0.3128	0.3181	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Door			4.1400	1.0000	4.1400			(26)
Window			8.5100	0.7752	6.5969			(27)
GF			41.1800	0.0900	3.7062	75.0000	3088.5000	(28a)
Exposed Floor			8.6000	0.1400	1.2040	20.0000	172.0000	(28b)
Main	71.8472	12.6500	59.1972	0.1300	7.6956	9.0000	532.7748	(29a)
PIJ	49.7800		49.7800	0.1300	6.4714	9.0000	448.0200	(30)
Total net area of external elements Aum(A, m2)			171.4072					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.8141			(33)
Main dwelling								
Party Wall 1			81.2200	0.0000	0.0000	20.0000	1624.4000	(32)
Timber			96.4800			9.0000	868.3200	(32c)
FF			41.1800			18.0000	741.2400	(32d)
GF			41.1800			9.0000	370.6200	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	7845.8748 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		86.2563 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	8.6300	0.1150	0.9925
E3 Sill	8.6300	0.0170	0.1467
E4 Jamb	28.2000	0.0940	2.6508
E5 Ground floor (normal)	16.6400	0.0670	1.1149
E16 Corner (normal)	4.9600	0.0680	0.3373
E12 Gable (insulation at ceiling level)	11.0000	0.0770	0.8470
E6 Intermediate floor within a dwelling	11.0000	0.0320	0.3520
E17 Corner (inverted - internal area greater than external area)	4.9600	-0.0290	-0.1438
P1 Party wall - Ground floor	12.4600	0.3200	3.9872
E20 Exposed floor (normal)	6.4400	0.0790	0.5088
E21 Exposed floor (inverted)	12.0800	0.0630	0.7610
E18 Party wall between dwellings	11.1200	0.0920	1.0230
P4 Party wall - Roof (insulation at ceiling level)	18.1000	0.1020	1.8462
E25 Staggered party wall between dwellings	9.9200	0.0560	0.5555

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		14.9790 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	44.7932 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	26.9362	26.5145	26.5145	24.8279	25.2495	23.1413	22.2980	22.2980	23.1413	24.8279	24.8279	25.2495	(38)
Heat transfer coeff													
	71.7293	71.3077	71.3077	69.6211	70.0427	67.9345	67.0912	67.0912	67.9345	69.6211	69.6211	70.0427	(39)
Average = Sum(39)m / 12 =												69.4454	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7886	0.7839	0.7839	0.7654	0.7700	0.7469	0.7376	0.7376	0.7469	0.7654	0.7654	0.7700	(40)
HLP (average)												0.7635	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.6386	(42)

Hot water usage for mixer showers

68.4610	67.4321	65.9329	63.0644	60.9476	58.5869	57.2450	58.7329	60.3639	62.8986	65.8287	68.1987	(42a)

Hot water usage for baths

29.5637	29.1246	28.5063	27.3663	26.5127	25.5661	25.0549	25.6688	26.3373	27.3502	28.5137	29.4637	(42b)

Hot water usage for other uses

41.6522	40.1376	38.6230	37.1084	35.5937	34.0791	34.0791	35.5937	37.1084	38.6230	40.1376	41.6522	(42c)

Average daily hot water use (litres/day)	128.3946	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	139.6769	136.6944	133.0622	127.5391	123.0540	118.2321	116.3790	119.9955	123.8096	128.8717	134.4799	139.3147	(44)
Energy conte	221.2141	194.6510	204.5117	174.5947	165.6543	145.3802	140.7503	148.5795	152.6696	174.8777	191.5913	218.1331	(45)
Energy content (annual)										Total = Sum(45)m =		2132.6075	
Distribution loss (46)m = 0.15 x (45)m													
	33.1821	29.1976	30.6768	26.1892	24.8482	21.8070	21.1126	22.2869	22.9004	26.2317	28.7387	32.7200	(46)

Water storage loss:		
Store volume	210.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):	1.5800	(48)
Temperature factor from Table 2b	0.5400	(49)
Enter (49) or (54) in (55)	0.8532	(55)

Total storage loss

26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(56)

If cylinder contains dedicated solar storage

26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(57)

Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	270.9257	239.5518	254.2233	222.7027	215.3659	193.4882	190.4619	198.2911	200.7776	224.5893	239.6993	267.8447	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	270.9257	239.5518	254.2233	222.7027	215.3659	193.4882	190.4619	198.2911	200.7776	224.5893	239.6993	267.8447	(64)
										Total per year (kWh/year) = Sum(64)m =		2717.9215	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	113.3230	100.6421	107.7694	96.5391	94.8493	86.8253	86.5688	89.1720	89.2490	97.9161	102.1905	112.2985	(65)

5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	35.2685	31.3252	25.4754	19.2865	14.4169	12.1713	13.1516	17.0949	22.9447	29.1336	34.0032	36.2488	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	359.4520	363.1820	353.7825	333.7722	308.5128	284.7725	268.9125	265.1825	274.5820	294.5923	319.8517	343.5920	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	(71)
Water heating gains (Table 5)													
	152.3158	149.7650	144.8514	134.0821	127.4857	120.5907	116.3559	119.8548	123.9570	131.6077	141.9313	150.9389	(72)
Total internal gains													
	653.2794	650.5153	630.3524	593.3839	556.6585	523.7777	504.6631	508.3753	527.7268	561.5767	602.0293	637.0228	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	4.9800	16.6187	0.3000	0.0000	0.7700	19.1178	(76)
West	3.5300	16.6187	0.3000	0.0000	0.7700	13.5514	(80)

Solar gains	32.6692	67.1355	116.6090	172.9395	207.2659	216.2037	201.7650	170.7039	137.1149	82.8303	42.3057	28.7264	(83)
Total gains	685.9486	717.6508	746.9614	766.3235	763.9244	739.9813	706.4281	679.0793	664.8417	644.4070	644.3350	665.7491	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	30.3838	30.5635	30.5635	31.3039	31.1154	32.0811	32.4843	32.4843	32.0811	31.3039	31.3039	31.1154	
alpha	3.0256	3.0376	3.0376	3.0869	3.0744	3.1387	3.1656	3.1656	3.1387	3.0869	3.0869	3.0744	
util living area													
	0.9068	0.8885	0.8547	0.7779	0.6639	0.5092	0.4021	0.4249	0.6142	0.7907	0.8753	0.9119	(86)
Living	19.4513	19.6333	19.9188	20.3753	20.7083	20.9113	20.9677	20.9614	20.8259	20.4264	19.9252	19.4545	
Non living	18.8455	19.0256	19.3024	19.7502	20.0520	20.2411	20.2904	20.2865	20.1745	19.8040	19.3250	18.8607	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.2077	19.6333	19.9188	20.3753	20.7083	20.9113	20.9677	20.9614	20.8259	20.4264	19.9252	19.6707	(87)
Th 2	20.2632	20.2673	20.2673	20.2834	20.2794	20.2996	20.3077	20.3077	20.2996	20.2834	20.2834	20.2794	(88)
util rest of house													
	0.8972	0.8771	0.8397	0.7545	0.6273	0.4591	0.3436	0.3654	0.5682	0.7644	0.8610	0.9028	(89)
MIT 2	19.5380	19.0256	19.3024	19.7502	20.0520	20.2411	20.2904	20.2865	20.1745	19.8040	19.3250	19.0592	(90)
Living area fraction										fLA = Living area / (4) =		0.3196	(91)
MIT	19.7520	19.2198	19.4994	19.9500	20.2617	20.4553	20.5069	20.5022	20.3827	20.0029	19.5168	19.2546	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7520	19.2198	19.4994	19.9500	20.2617	20.4553	20.5069	20.5022	20.3827	20.0029	19.5168	19.2546	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8898	0.8583	0.8219	0.7427	0.6263	0.4706	0.3608	0.3825	0.5739	0.7531	0.8436	0.8880	(94)
Useful gains	610.3675	615.9874	613.9316	569.1664	478.4751	348.2089	254.8526	259.7206	381.5666	485.3317	543.5328	591.1572	(95)
Ext temp.	4.7000	5.3000	6.7000	9.3000	12.3000	15.0000	16.6000	16.5000	14.1000	10.8000	7.5000	4.6000	(96)
Heat loss rate W													
	1079.6717	992.5909	912.6936	741.4636	557.6596	370.6022	262.1157	268.5111	426.8125	640.7179	836.6232	1026.4484	(97)
Space heating kWh													
	349.1623	253.0776	222.2789	124.0540	58.9133	0.0000	0.0000	0.0000	0.0000	115.6073	211.0251	323.8566	(98a)
Space heating requirement - total per year (kWh/year)												1657.9750	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	349.1623	253.0776	222.2789	124.0540	58.9133	0.0000	0.0000	0.0000	0.0000	115.6073	211.0251	323.8566	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1657.9750	
Space heating per m2											(98c) / (4) =	18.2275	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												269.9311	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	349.1623	253.0776	222.2789	124.0540	58.9133	0.0000	0.0000	0.0000	0.0000	115.6073	211.0251	323.8566	(98)
Space heating efficiency (main heating system 1)													
	269.9311	269.9311	269.9311	269.9311	269.9311	0.0000	0.0000	0.0000	0.0000	269.9311	269.9311	269.9311	(210)
Space heating fuel (main heating system)													
	129.3524	93.7564	82.3465	45.9576	21.8253	0.0000	0.0000	0.0000	0.0000	42.8284	78.1774	119.9775	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	270.9257	239.5518	254.2233	222.7027	215.3659	193.4882	190.4619	198.2911	200.7776	224.5893	239.6993	267.8447	(64)
Efficiency of water heater												281.3569	(216)
(217)m	281.3569	281.3569	281.3569	281.3569	281.3569	281.3569	281.3569	281.3569	281.3569	281.3569	281.3569	281.3569	(217)
Fuel for water heating, kWh/month													
	96.2925	85.1416	90.3562	79.1531	76.5455	68.7697	67.6941	70.4767	71.3605	79.8236	85.1940	95.1975	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	29.6563	26.7864	29.6563	28.6997	29.6563	28.6997	29.6563	29.6563	28.6997	29.6563	28.6997	29.6563	(231)
Lighting	30.8703	24.7653	22.2984	16.3368	12.6190	10.3098	11.5115	14.9631	19.4355	25.5005	28.8027	31.7283	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												614.2216	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												281.3569	
Water heating fuel used												966.0048	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.1900)													
mechanical ventilation fans (SFP = 1.1900)												349.1794	(230a)
Total electricity for the above, kWh/year												349.1794	(231)
Electricity for lighting (calculated in Appendix L)												249.1413	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												2178.5472	(238)

10a. Fuel costs - using BEDF prices (583)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	614.2216	28.4300	174.6232	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	966.0048	28.4300	274.6352	(247)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(247a)
Pumps, fans and electric keep-hot	349.1794	28.4300	99.2717	(249)
Energy for lighting	249.1413	28.4300	70.8309	(250)
Additional standing charges			0.0000	(251)
Total energy cost			619.3610	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	614.2216	0.1552	95.3232	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	966.0048	0.1410	136.1690	(264)
Space and water heating			231.4921	(265)
Pumps, fans and electric keep-hot	349.1794	0.1387	48.4355	(267)
Energy for lighting	249.1413	0.1443	35.9588	(268)
Total CO2, kg/year			315.8864	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	614.2216	1.5746	967.1236	(275)
Total CO2 associated with community systems			0.0000	(473)

Water heating (other fuel)	966.0048	1.5212	1469.5113 (278)
Space and water heating			2436.6349 (279)
Pumps, fans and electric keep-hot	349.1794	1.5128	528.2386 (281)
Energy for lighting	249.1413	1.5338	382.1413 (282)
Total Primary energy kWh/year			3347.0147 (286)

SAP 10 EPC IMPROVEMENTS

001

Current energy efficiency rating: B 84
Current environmental impact rating: A 97

N Solar water heating	Recommended
U Solar photovoltaic panels	Recommended
V2 Wind turbine	Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
N Solar water heating	+ 1.4	-£ 53	-23 kg (7.2%)
U Solar photovoltaic panels	+ 8.2	-£ 277	-207 kg (70.6%)

	Typical annual savings		Energy efficiency	Environmental impact
Recommended measures				
Solar water heating	£53	0.25 kg/m²	B 86	A 97
Solar photovoltaic panels	£277	2.27 kg/m²	A 94	A 99
Total Savings	£330	2.52 kg/m²		

Potential energy efficiency rating: A 94
Potential environmental impact rating: A 99

Fuel prices for cost data on this page from database revision number 583 TEST (01 Oct 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, West Pennines (England)):

	Current	Potential	Saving
Electricity	£619	£567	£53
Space heating	£274	£300	-£26
Water heating	£275	£196	£78
Lighting	£71	£71	£0
Generated (PV)	-£0	-£277	£277
Total cost of fuels	£619	£290	£330
Total cost of uses	£620	£290	£329
Delivered energy	24 kWh/m²	4 kWh/m²	20 kWh/m²
Carbon dioxide emissions	0.3 tonnes	0.1 tonnes	0.2 tonnes
CO2 emissions per m²	3 kg/m²	1 kg/m²	3 kg/m²
Primary energy	37 kWh/m²	17 kWh/m²	20 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	41.1800 (1b)	x	2.4800 (2b)	=	102.1264	(1b) - (3b)
First floor	49.7800 (1c)	x	2.7800 (2c)	=	138.3884	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	90.9600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	240.5148	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.2500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2125	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													
	0.2709	0.2656	0.2603	0.2338	0.2284	0.2019	0.2019	0.1966	0.2125	0.2284	0.2391	0.2497	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	81.0000	(23c)

Effective ac	0.3659	0.3606	0.3553	0.3287	0.3234	0.2969	0.2969	0.2916	0.3075	0.3234	0.3341	0.3447	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Door			4.1400	1.0000	4.1400			(26)
Window			8.5100	0.7752	6.5969			(27)
GF			41.1800	0.0900	3.7062	75.0000	3088.5000	(28a)
Exposed Floor			8.6000	0.1400	1.2040	20.0000	172.0000	(28b)
Main	71.8472	12.6500	59.1972	0.1300	7.6956	9.0000	532.7748	(29a)
PIJ	49.7800		49.7800	0.1300	6.4714	9.0000	448.0200	(30)
Total net area of external elements Aum(A, m2)			171.4072					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.8141			(33)
Main dwelling								
Party Wall 1			81.2200	0.0000	0.0000	20.0000	1624.4000	(32)
Timber			96.4800			9.0000	868.3200	(32c)
FF			41.1800			18.0000	741.2400	(32d)
GF			41.1800			9.0000	370.6200	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 7845.8748	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	86.2563	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	8.6300	0.1150	0.9925
E3 Sill	8.6300	0.0170	0.1467
E4 Jamb	28.2000	0.0940	2.6508
E5 Ground floor (normal)	16.6400	0.0670	1.1149
E16 Corner (normal)	4.9600	0.0680	0.3373
E12 Gable (insulation at ceiling level)	11.0000	0.0770	0.8470
E6 Intermediate floor within a dwelling	11.0000	0.0320	0.3520
E17 Corner (inverted - internal area greater than external area)	4.9600	-0.0290	-0.1438
P1 Party wall - Ground floor	12.4600	0.3200	3.9872
E20 Exposed floor (normal)	6.4400	0.0790	0.5088
E21 Exposed floor (inverted)	12.0800	0.0630	0.7610
E18 Party wall between dwellings	11.1200	0.0920	1.0230
P4 Party wall - Roof (insulation at ceiling level)	18.1000	0.1020	1.8462
E25 Staggered party wall between dwellings	9.9200	0.0560	0.5555

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	14.9790	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	44.7932	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	29.0444	28.6228	28.2011	26.0928	25.6712	23.5629	23.5629	23.1413	24.4062	25.6712	26.5145	27.3578	(38)
Heat transfer coeff													
	73.8376	73.4159	72.9943	70.8860	70.4644	68.3561	68.3561	67.9345	69.1994	70.4644	71.3077	72.1510	(39)
Average = Sum(39)m / 12 =												70.7806	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8118	0.8071	0.8025	0.7793	0.7747	0.7515	0.7515	0.7469	0.7608	0.7747	0.7839	0.7932	(40)
HLP (average)												0.7782	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.6386	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
68.4610	67.4321	65.9329	63.0644	60.9476	58.5869	57.2450	58.7329	60.3639	62.8986	65.8287	68.1987	(42a)

Hot water usage for baths

29.5637	29.1246	28.5063	27.3663	26.5127	25.5661	25.0549	25.6688	26.3373	27.3502	28.5137	29.4637	(42b)

Hot water usage for other uses

41.6522	40.1376	38.6230	37.1084	35.5937	34.0791	34.0791	35.5937	37.1084	38.6230	40.1376	41.6522	(42c)

Average daily hot water use (litres/day)	128.3946	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	139.6769	136.6944	133.0622	127.5391	123.0540	118.2321	116.3790	119.9955	123.8096	128.8717	134.4799	139.3147	(44)
Energy conte	221.2141	194.6510	204.5117	174.5947	165.6543	145.3802	140.7503	148.5795	152.6696	174.8777	191.5913	218.1331	(45)
Energy content (annual)											Total = Sum(45)m =	2132.6075	
Distribution loss (46)m = 0.15 x (45)m													
	33.1821	29.1976	30.6768	26.1892	24.8482	21.8070	21.1126	22.2869	22.9004	26.2317	28.7387	32.7200	(46)

Water storage loss:		
Store volume	210.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):	1.5800	(48)
Temperature factor from Table 2b	0.5400	(49)
Enter (49) or (54) in (55)	0.8532	(55)

Total storage loss

26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(56)

If cylinder contains dedicated solar storage

17.0031	15.3576	17.0031	16.4546	17.0031	16.4546	17.0031	17.0031	16.4546	17.0031	16.4546	17.0031	(57)
Primary loss 23.2624	21.0112	21.8667	15.7584	10.4681	9.9053	10.2355	11.1660	17.1091	21.8667	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

261.4795	231.0198	243.3814	206.8077	193.1255	171.7400	167.9889	176.7485	186.2333	213.7474	230.5579	258.3985	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)

Aperture area of solar collector	3.0000	(H1)
Zero-loss collector efficiency	0.8000	(H2)
Collector linear heat loss coefficient	1.8000	(H3)
Collector 2nd order heat loss coefficient	0.0000	(H4)
Collector loop efficiency	0.9000	(H5)
Incidence angle modifier	1.0000	(H6)

Overshading factor												0.8000	(H8)
Overall heat loss coefficient of system												6.5000	(H10)
Heat loss coefficient of collector loop												3.9667	(H11)
Dedicated solar storage volume												75.0000	(H12)
If combined cylinder, total volume of cylinder												210.0000	(H13)
Effective solar volume												115.5000	(H14)
Reference volume												225.0000	(H15)
Storage tank correction coefficient												1.1814	(H16)
Heat delivered to hot water												654.6757	(H24)
Heat delivered to space heating												0.0000	(H29)
Solar input												654.6757	
Solar input	-0.0000	-20.1906	-62.4438	-83.8682	-107.6151	-99.0457	-98.2732	-86.8675	-61.6791	-33.2791	-1.4133	-0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	261.4795	210.8291	180.9377	122.9394	85.5104	72.6943	69.7156	89.8809	124.5542	180.4683	229.1446	258.3985	(64)
									Total per year (kWh/year) = Sum(64)m =			1886.5527	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
								Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =				0.0000	(64a)
Heat gains from water heating, kWh/month													
	105.7660	93.8165	99.0959	83.8231	77.0570	69.4268	68.5903	71.9379	77.6136	89.2426	94.8774	104.7416	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	35.2685	31.3252	25.4754	19.2865	14.4169	12.1713	13.1516	17.0949	22.9447	29.1336	34.0032	36.2488	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	359.4520	363.1820	353.7825	333.7722	308.5128	284.7725	268.9125	265.1825	274.5820	294.5923	319.8517	343.5920	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	(71)
Water heating gains (Table 5)													
	142.1587	139.6079	133.1934	116.4210	103.5712	96.4261	92.1913	96.6907	107.7967	119.9497	131.7741	140.7817	(72)
Total internal gains													
	643.1223	640.3582	618.6944	575.7228	532.7440	499.6131	480.4985	485.2112	511.5665	549.9188	591.8722	626.8656	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	4.9800	19.6403	0.3000	0.0000	0.7700	22.5938	(76)
West	3.5300	19.6403	0.3000	0.0000	0.7700	16.0153	(80)

Solar gains	38.6090	75.5274	124.3829	181.4051	222.3188	227.5828	216.6681	186.1147	144.6625	89.6197	48.1409	31.7502	(83)
Total gains	681.7313	715.8856	743.0774	757.1279	755.0628	727.1959	697.1666	671.3260	656.2290	639.5384	640.0131	658.6158	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	29.5163	29.6858	29.8573	30.7453	30.9292	31.8832	31.8832	32.0811	31.4946	30.9292	30.5635	30.2062	
alpha	2.9678	2.9791	2.9905	3.0497	3.0619	3.1255	3.1255	3.1387	3.0996	3.0619	3.0376	3.0137	
util living area													
	0.9149	0.8975	0.8632	0.7979	0.6981	0.5458	0.4131	0.4419	0.6261	0.8025	0.8868	0.9205	(86)
Living	19.2926	19.4854	19.8269	20.2792	20.6349	20.8832	20.9633	20.9544	20.8091	20.3747	19.7986	19.2886	
Non living	18.6754	18.8666	19.2017	19.6505	19.9836	20.2157	20.2759	20.2741	20.1501	19.7496	19.1904	18.6835	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.1265	19.4854	19.8269	20.2792	20.6349	20.8832	20.9633	20.9544	20.8091	20.3747	19.7986	19.5280	(87)
Th 2	20.2432	20.2472	20.2512	20.2713	20.2753	20.2956	20.2956	20.2996	20.2875	20.2753	20.2673	20.2592	(88)
util rest of house													
	0.9060	0.8870	0.8488	0.7761	0.6646	0.4972	0.3525	0.3814	0.5794	0.7774	0.8737	0.9123	(89)
MIT 2	19.4412	18.8666	19.2017	19.6505	19.9836	20.2157	20.2759	20.2741	20.1501	19.7496	19.1904	18.9039	(90)
Living area fraction										fLA = Living area / (4) =		0.3196	(91)
MIT	19.6602	19.0644	19.4015	19.8514	20.1917	20.4290	20.4956	20.4915	20.3607	19.9494	19.3848	19.1034	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6602	19.0644	19.4015	19.8514	20.1917	20.4290	20.4956	20.4915	20.3607	19.9494	19.3848	19.1034	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8985	0.8676	0.8301	0.7624	0.6605	0.5067	0.3701	0.3984	0.5845	0.7649	0.8555	0.8972	(94)
Useful gains	612.5056	621.0786	616.8621	577.2369	498.7053	368.4672	258.0023	267.4529	383.5338	489.1698	547.5142	590.8996	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1134.1604	1039.8893	941.7389	776.3046	598.3657	398.4481	266.2854	277.9551	433.2382	658.7983	875.9978	1075.2926	(97)
Space heating kWh													
	388.1112	281.4408	241.7084	143.3288	74.1473	0.0000	0.0000	0.0000	0.0000	126.2036	236.5082	360.3884	(98a)
Space heating requirement - total per year (kWh/year)												1851.8366	
Solar heating kWh													
	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	388.1112	281.4408	241.7084	143.3288	74.1473	0.0000	0.0000	0.0000	0.0000	126.2036	236.5082	360.3884	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1851.8366	
Space heating per m2											(98c) / (4) =	20.3588	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												270.8847	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	388.1112	281.4408	241.7084	143.3288	74.1473	0.0000	0.0000	0.0000	0.0000	126.2036	236.5082	360.3884	(98)
Space heating efficiency (main heating system 1)													
	270.8847	270.8847	270.8847	270.8847	270.8847	0.0000	0.0000	0.0000	0.0000	270.8847	270.8847	270.8847	(210)
Space heating fuel (main heating system)													
	143.2754	103.8969	89.2293	52.9114	27.3723	0.0000	0.0000	0.0000	0.0000	46.5894	87.3095	133.0413	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	261.4795	210.8291	180.9377	122.9394	85.5104	72.6943	69.7156	89.8809	124.5542	180.4683	229.1446	258.3985	(64)
Efficiency of water heater												281.0493	(216)
(217)m	281.0493	281.0493	281.0493	281.0493	281.0493	281.0493	281.0493	281.0493	281.0493	281.0493	281.0493	281.0493	(217)
Fuel for water heating, kWh/month													
	93.0369	75.0150	64.3793	43.7430	30.4254	25.8653	24.8055	31.9805	44.3176	64.2123	81.5318	91.9407	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	36.4509	32.9233	36.4509	35.2750	36.4509	35.2750	36.4509	36.4509	35.2750	36.4509	35.2750	36.4509	(231)
Lighting	30.8703	24.7653	22.2984	16.3368	12.6190	10.3098	11.5115	14.9631	19.4355	25.5005	28.8027	31.7283	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-37.4213	-55.2968	-82.6096	-94.8967	-102.3683	-93.3004	-92.1878	-86.5597	-76.2056	-63.7310	-41.7430	-31.9501	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-12.6652	-28.2832	-59.7367	-95.8754	-133.3145	-138.4133	-136.4638	-113.2143	-80.2575	-43.1148	-17.6668	-9.9637	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												683.6254	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												281.0493	
Water heating fuel used												671.2534	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.1900)													
mechanical ventilation fans (SFP = 1.1900)												349.1794	(230a)
pump for solar water heating												80.0000	(230g)
Total electricity for the above, kWh/year												429.1794	(231)
Electricity for lighting (calculated in Appendix L)												249.1413	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1727.2394	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												305.9602	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	683.6254	16.4900	112.7298	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	671.2534	16.4900	110.6897	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	349.1794	16.4900	57.5797	(249)
Pump for solar water heating	80.0000	16.4900	13.1920	(249)
Energy for lighting	249.1413	16.4900	41.0834	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-858.2703	16.4900	-141.5288	
PV Unit electricity exported	-868.9691	5.5900	-48.5754	
Total			-190.1041	(252)
Total energy cost			145.1705	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.3844	(257)
SAP value		93.7691	
SAP rating (Section 12)		94	(258)
SAP band		A	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	683.6254	0.1551	106.0146	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	671.2534	0.1462	98.1652	(264)
Space and water heating			204.1797	(265)
Pumps, fans and electric keep-hot	429.1794	0.1387	59.5325	(267)
Energy for lighting	249.1413	0.1443	35.9588	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-858.2703	0.1343	-115.2684	
PV Unit electricity exported	-868.9691	0.1239	-107.6587	
Total			-222.9271	(269)
Total CO2, kg/year			76.7439	(272)
CO2 emissions per m2			0.8400	(273)
EI value			99.2436	
EI rating			99	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	41.1800	(1b) x	2.4800	(2b) =	102.1264	(1b) - (3b)
First floor	49.7800	(1c) x	2.7800	(2c) =	138.3884	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	90.9600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		240.5148	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.2500 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2125 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.6000	4.5000	4.5000	4.1000	4.2000	3.7000	3.5000	3.5000	3.7000	4.1000	4.1000	4.2000	(22)
Wind factor	1.1500	1.1250	1.1250	1.0250	1.0500	0.9250	0.8750	0.8750	0.9250	1.0250	1.0250	1.0500	(22a)
Adj infilt rate	0.2444	0.2391	0.2391	0.2178	0.2231	0.1966	0.1859	0.1859	0.1966	0.2178	0.2178	0.2231	(22b)
Balanced mechanical ventilation with heat recovery													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												81.0000	(23c)
Effective ac	0.3394	0.3341	0.3341	0.3128	0.3181	0.2916	0.2809	0.2809	0.2916	0.3128	0.3128	0.3181	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door			4.1400	1.0000	4.1400			(26)
Window			8.5100	0.7752	6.5969			(27)
GF			41.1800	0.0900	3.7062	75.0000	3088.5000	(28a)
Exposed Floor			8.6000	0.1400	1.2040	20.0000	172.0000	(28b)
Main	71.8472	12.6500	59.1972	0.1300	7.6956	9.0000	532.7748	(29a)
PIJ	49.7800		49.7800	0.1300	6.4714	9.0000	448.0200	(30)
Total net area of external elements Aum(A, m2)			171.4072					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.8141			(33)
Main dwelling								
Party Wall 1			81.2200	0.0000	0.0000	20.0000	1624.4000	(32)
Timber			96.4800			9.0000	868.3200	(32c)
FF			41.1800			18.0000	741.2400	(32d)
GF			41.1800			9.0000	370.6200	(32e)
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =			7845.8748	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 86.2563 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	8.6300	0.1150	0.9925
E3 Sill	8.6300	0.0170	0.1467
E4 Jamb	28.2000	0.0940	2.6508
E5 Ground floor (normal)	16.6400	0.0670	1.1149
E16 Corner (normal)	4.9600	0.0680	0.3373
E12 Gable (insulation at ceiling level)	11.0000	0.0770	0.8470
E6 Intermediate floor within a dwelling	11.0000	0.0320	0.3520
E17 Corner (inverted - internal area greater than external area)	4.9600	-0.0290	-0.1438
P1 Party wall - Ground floor	12.4600	0.3200	3.9872
E20 Exposed floor (normal)	6.4400	0.0790	0.5088
E21 Exposed floor (inverted)	12.0800	0.0630	0.7610
E18 Party wall between dwellings	11.1200	0.0920	1.0230
P4 Party wall - Roof (insulation at ceiling level)	18.1000	0.1020	1.8462
E25 Staggered party wall between dwellings	9.9200	0.0560	0.5555

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 14.9790 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 44.7932 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	26.9362	26.5145	26.5145	24.8279	25.2495	23.1413	22.2980	22.2980	23.1413	24.8279	24.8279	25.2495	(38)
Heat transfer coeff	71.7293	71.3077	71.3077	69.6211	70.0427	67.9345	67.0912	67.0912	67.9345	69.6211	69.6211	70.0427	(39)
Average = Sum(39)m / 12 =												69.4454	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7886	0.7839	0.7839	0.7654	0.7700	0.7469	0.7376	0.7376	0.7469	0.7654	0.7654	0.7700	(40)
HLP (average)												0.7635	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6386 (42)
Hot water usage for mixer showers

68.4610	67.4321	65.9329	63.0644	60.9476	58.5869	57.2450	58.7329	60.3639	62.8986	65.8287	68.1987	(42a)

Hot water usage for baths

29.5637	29.1246	28.5063	27.3663	26.5127	25.5661	25.0549	25.6688	26.3373	27.3502	28.5137	29.4637	(42b)

Hot water usage for other uses

41.6522	40.1376	38.6230	37.1084	35.5937	34.0791	34.0791	35.5937	37.1084	38.6230	40.1376	41.6522	(42c)

Average daily hot water use (litres/day) 128.3946 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	139.6769	136.6944	133.0622	127.5391	123.0540	118.2321	116.3790	119.9955	123.8096	128.8717	134.4799	139.3147	(44)
Energy conte	221.2141	194.6510	204.5117	174.5947	165.6543	145.3802	140.7503	148.5795	152.6696	174.8777	191.5913	218.1331	(45)
Energy content (annual)										Total = Sum(45)m =		2132.6075	

Distribution loss (46)m = 0.15 x (45)m

33.1821	29.1976	30.6768	26.1892	24.8482	21.8070	21.1126	22.2869	22.9004	26.2317	28.7387	32.7200	(46)

Water storage loss:
Store volume 210.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.5800 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.8532 (55)
Total storage loss

26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(56)

If cylinder contains dedicated solar storage

17.0031	15.3576	17.0031	16.4546	17.0031	16.4546	17.0031	17.0031	16.4546	17.0031	16.4546	17.0031	(57)
23.2624	21.0112	21.8667	15.7584	10.4681	9.9053	10.2355	11.1660	17.1091	21.8667	22.5120	23.2624	(59)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

261.4795	231.0198	243.3814	206.8077	193.1255	171.7400	167.9889	176.7485	186.2333	213.7474	230.5579	258.3985	(62)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)

Aperture area of solar collector 3.0000 (H1)
Zero-loss collector efficiency 0.8000 (H2)
Collector linear heat loss coefficient 1.8000 (H3)
Collector 2nd order heat loss coefficient 0.0000 (H4)
Collector loop efficiency 0.9000 (H5)
Incidence angle modifier 1.0000 (H6)
Overshading factor 0.8000 (H8)
Overall heat loss coefficient of system 6.5000 (H10)
Heat loss coefficient of collector loop 3.9667 (H11)
Dedicated solar storage volume 75.0000 (H12)
If combined cylinder, total volume of cylinder 210.0000 (H13)
Effective solar volume 115.5000 (H14)
Reference volume 225.0000 (H15)
Storage tank correction coefficient 1.1814 (H16)
Heat delivered to hot water 599.1897 (H24)
Heat delivered to space heating 0.0000 (H29)
Solar input 599.1897

-0.0000	-14.4822	-56.8249	-79.3403	-100.2904	-94.0949	-90.8995	-78.3168	-56.9604	-27.9802	-0.0000	-0.0000	(63c)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

261.4795	216.5376	186.5565	127.4673	92.8350	77.6451	77.0894	98.4317	129.2728	185.7672	230.5579	258.3985	(64)
									Total per year (kWh/year) = Sum(64)m =		1942.0387	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)

Heat gains from water heating, kWh/month

105.7660	93.8165	99.0959	83.8231	77.0570	69.4268	68.5903	71.9379	77.6136	89.2426	94.8774	104.7416	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	35.2685	31.3252	25.4754	19.2865	14.4169	12.1713	13.1516	17.0949	22.9447	29.1336	34.0032	36.2488	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	359.4520	363.1820	353.7825	333.7722	308.5128	284.7725	268.9125	265.1825	274.5820	294.5923	319.8517	343.5920	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	(69)

Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	(71)
Water heating gains (Table 5)	142.1587	139.6079	133.1934	116.4210	103.5712	96.4261	92.1913	96.6907	107.7967	119.9497	131.7741	140.7817	(72)
Total internal gains	643.1223	640.3582	618.6944	575.7228	532.7440	499.6131	480.4985	485.2112	511.5665	549.9188	591.8722	626.8656	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	4.9800	16.6187	0.3000	0.0000	0.7700	19.1178	(76)
West	3.5300	16.6187	0.3000	0.0000	0.7700	13.5514	(80)

Solar gains	32.6692	67.1355	116.6090	172.9395	207.2659	216.2037	201.7650	170.7039	137.1149	82.8303	42.3057	28.7264	(83)
Total gains	675.7915	707.4937	735.3035	748.6623	740.0099	715.8167	682.2635	655.9152	648.6814	632.7491	634.1778	655.5920	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	30.3838	30.5635	30.5635	31.3039	31.1154	32.0811	32.4843	32.4843	32.0811	31.3039	31.3039	31.1154	
alpha	3.0256	3.0376	3.0376	3.0869	3.0744	3.1387	3.1656	3.1656	3.1387	3.0869	3.0869	3.0744	
util living area	0.9097	0.8917	0.8591	0.7862	0.6771	0.5231	0.4148	0.4381	0.6248	0.7970	0.8793	0.9148	(86)
Living	19.4308	19.6142	19.8995	20.3539	20.6910	20.9043	20.9647	20.9579	20.8171	20.4115	19.9069	19.4335	
Non living	18.8258	19.0073	19.2842	19.7308	20.0377	20.2363	20.2887	20.2845	20.1678	19.7907	19.3077	18.8405	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.1973	19.6142	19.8995	20.3539	20.6910	20.9043	20.9647	20.9579	20.8171	20.4115	19.9069	19.6526	(87)
Th 2	20.2632	20.2673	20.2673	20.2834	20.2794	20.2996	20.3077	20.3077	20.2996	20.2834	20.2834	20.2794	(88)
util rest of house	0.9004	0.8806	0.8443	0.7633	0.6408	0.4723	0.3550	0.3772	0.5788	0.7711	0.8653	0.9060	(89)
MIT 2	19.5279	19.0073	19.2842	19.7308	20.0377	20.2363	20.2887	20.2845	20.1678	19.7907	19.3077	19.0418	(90)
Living area fraction									fLA = Living area / (4) =			0.3196	(91)
MIT	19.7418	19.2013	19.4809	19.9299	20.2465	20.4498	20.5048	20.4997	20.3753	19.9891	19.4992	19.2370	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7418	19.2013	19.4809	19.9299	20.2465	20.4498	20.5048	20.4997	20.3753	19.9891	19.4992	19.2370	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8930	0.8618	0.8264	0.7509	0.6390	0.4835	0.3723	0.3945	0.5840	0.7595	0.8478	0.8912	(94)
Useful gains	603.4859	609.7347	607.6374	562.2002	472.8993	346.0816	254.0301	258.7483	378.8167	480.5478	537.6294	584.2708	(95)
Ext temp.	4.7000	5.3000	6.7000	9.3000	12.3000	15.0000	16.6000	16.5000	14.1000	10.8000	7.5000	4.6000	(96)
Heat loss rate W	1078.9393	991.2675	911.3729	740.0682	556.5933	370.2267	261.9745	268.3436	426.3094	639.7559	835.3990	1025.2150	(97)
Space heating kWh	353.7374	256.3901	225.9792	128.0650	62.2683	0.0000	0.0000	0.0000	0.0000	118.4508	214.3941	328.0625	(98a)
Space heating requirement - total per year (kWh/year)												1687.3474	
Solar heating kWh	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	353.7374	256.3901	225.9792	128.0650	62.2683	0.0000	0.0000	0.0000	0.0000	118.4508	214.3941	328.0625	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1687.3474	
Space heating per m2											(98c) / (4) =	18.5504	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	269.9311	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	353.7374	256.3901	225.9792	128.0650	62.2683	0.0000	0.0000	0.0000	0.0000	118.4508	214.3941	328.0625	(98)
Space heating efficiency (main heating system 1)	269.9311	269.9311	269.9311	269.9311	269.9311	0.0000	0.0000	0.0000	0.0000	269.9311	269.9311	269.9311	(210)
Space heating fuel (main heating system)	131.0473	94.9835	83.7174	47.4436	23.0682	0.0000	0.0000	0.0000	0.0000	43.8819	79.4255	121.5357	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	261.4795	216.5376	186.5565	127.4673	92.8350	77.6451	77.0894	98.4317	129.2728	185.7672	230.5579	258.3985	(64)
Efficiency of water heater												281.3569	(216)
(217)m	281.3569	281.3569	281.3569	281.3569	281.3569	281.3569	281.3569	281.3569	281.3569	281.3569	281.3569	281.3569	(217)
Fuel for water heating, kWh/month	92.9352	76.9619	66.3060	45.3045	32.9955	27.5967	27.3991	34.9846	45.9462	66.0255	81.9450	91.8401	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	36.4509	32.9233	36.4509	35.2750	36.4509	35.2750	36.4509	36.4509	35.2750	36.4509	35.2750	36.4509	(231)
Lighting	30.8703	24.7653	22.2984	16.3368	12.6190	10.3098	11.5115	14.9631	19.4355	25.5005	28.8027	31.7283	(232)

Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-32.3344	-50.2115	-78.6710	-91.6951	-98.0812	-90.9873	-89.0335	-82.6503	-73.7830	-60.0829	-37.4203	-29.2209 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-10.0465	-24.0818	-54.7786	-90.1742	-121.6439	-129.1407	-123.8907	-100.5819	-74.5168	-38.6686	-14.7883	-8.7012 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year		
Space heating fuel - main system 1	625.1031	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	281.3569	
Water heating fuel used	690.2402	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.1900)		
mechanical ventilation fans (SFP = 1.1900)	349.1794	(230a)
pump for solar water heating	80.0000	(230g)
Total electricity for the above, kWh/year	429.1794	(231)
Electricity for lighting (calculated in Appendix L)	249.1413	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1605.1846	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	388.4794	(238)

10a. Fuel costs - using BEDF prices (583)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	625.1031	28.4300	177.7168	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	690.2402	28.4300	196.2353	(247)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(247a)
Pumps, fans and electric keep-hot	349.1794	28.4300	99.2717	(249)
Pump for solar water heating	80.0000	28.4300	22.7440	(249)
Energy for lighting	249.1413	28.4300	70.8309	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-814.1715	28.4300	-231.4690	
PV Unit electricity exported	-791.0131	5.8100	-45.9579	
Total			-277.4268	(252)
Total energy cost			289.3718	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	625.1031	0.1551	96.9678	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	690.2402	0.1458	100.6408	(264)
Space and water heating			197.6086	(265)
Pumps, fans and electric keep-hot	429.1794	0.1387	59.5325	(267)
Energy for lighting	249.1413	0.1443	35.9588	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-814.1715	0.1339	-109.0444	
PV Unit electricity exported	-791.0131	0.1236	-97.8071	
Total			-206.8515	(269)
Total CO2, kg/year			86.2483	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	625.1031	1.5743	984.0930	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	690.2402	1.5394	1062.5234	(278)
Space and water heating			2046.6164	(279)
Pumps, fans and electric keep-hot	429.1794	1.5128	649.2626	(281)
Energy for lighting	249.1413	1.5338	382.1413	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-814.1715	1.4950	-1217.1654	
PV Unit electricity exported	-791.0131	0.4538	-358.9670	
Total			-1576.1324	(283)
Total Primary energy kWh/year			1501.8879	(286)

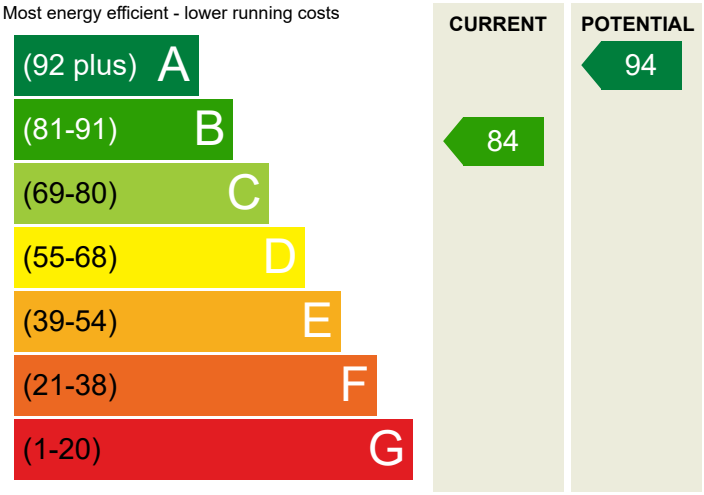
Energy Report

Dwelling Address	836 Rochdale Road, MANCHESTER, M9 8FA
Reference	78449-11-001
Assessment Date	02/07/2025
Submission Date	
Property Type	House, Mid-Terrace
Total Floor Area	91

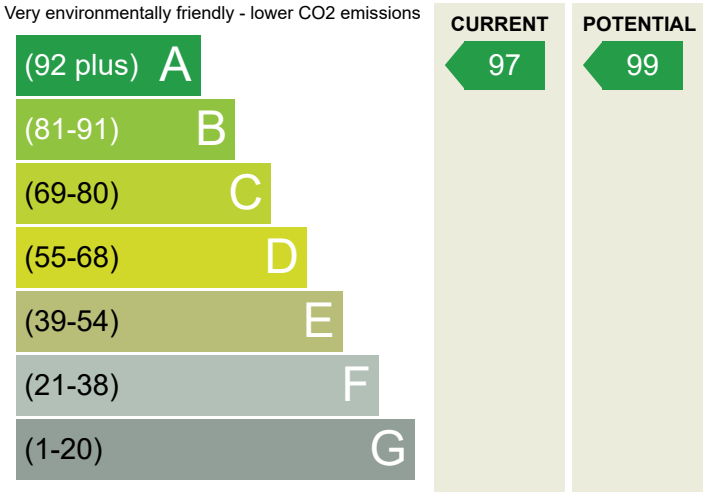
This Energy Report has been generated using the UK's National Calculation Methodology for dwellings, Standard Assessment Procedure (SAP). This methodology is used to assess the energy efficiency of dwellings which is calculated based on a dwelling's heating, hot water, ventilation and lighting usage.

This document is not an Energy Performance Certificate (EPC) as required by the Energy Performance of Buildings Regulations

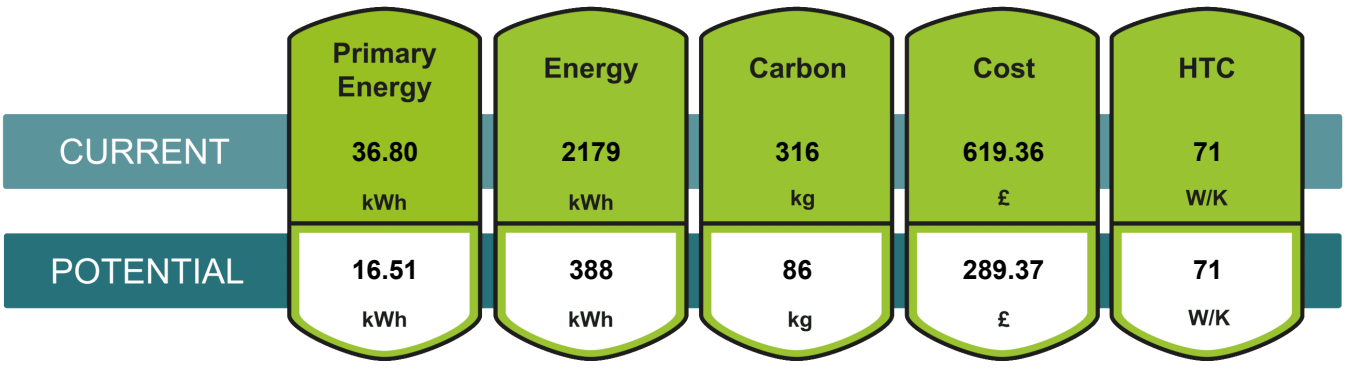
Energy Efficiency Rating



Carbon Dioxide (CO2) Emissions Rating



Additional ratings for your home



Energy Report

Breakdown of property's energy performance

Each feature is assessed as one of the following:

Very Poor | Poor | Average | Good | Very Good

Feature	Description	Energy Performance
Walls	Average thermal transmittance 0.13 W/m²K	Very Good
Roof	Average thermal transmittance 0.13 W/m²K	Very Good
Floor	Average thermal transmittance 0.1 W/m²K	Very Good
Windows	High performance glazing	Very Good
Main heating	Air source heat pump, radiators, electric	Good
Main heating controls	Programmer, room thermostat and TRVs	Good
Secondary heating	None	
Hot water	From main system	Good
Lighting	Good lighting efficiency	Good
Air tightness	Air permeability [AP50] = 5.0 m³/h.m² (as tested)	Good

Recommendations

The recommended measures provided below will help to improve the energy efficiency of the dwelling.
To reach the dwelling's potential energy rating all of the recommended measures shown below would need to be installed.
Having these measures installed individually or in any other order may give a different result when compared with the cumulative potential rating.

Recommended measures	Cumulative savings (per year)	Cumulative rating	Typical costs	Incremental savings (per year)	Cumulative CO2 rating
Solar water heating	£53	B 86	£4,000 - £7,000	£53	A 97
Photovoltaic	£330	A 94	£8,000 - £10,000	£277	A 99

Energy Report

The typical cost is based on average installation prices across the country so may not be representative of the actual costs in your area.

Estimated energy costs of the dwelling

The table below shows the estimated running costs of the space and water heating and lighting within the dwelling. It does not include the energy used from household appliances. The estimated annual costs after potential improvements indicates the total energy cost if all recommended measures named above were installed.

	Estimated annual costs	Estimated annual costs after potential improvements	Potential future savings
Lighting	£71	£71	
Heating	£274	£300	
Hot Water	£275	£196	
New Technologies e.g. Impact of PV	£0	-(£277)	
TOTAL	£619	£289	

Estimated energy use and potential savings

Space Heating
614
kWh per year

Water Heating
966
kWh per year

Energy Report

About this document

Created by:	
Company/Trading name:	
Phone number:	
Email address:	

Disclaimer

This Energy Report should not under any circumstances be treated as a Condition Survey and cannot be used to indicate that any element of the dwelling (e.g.heating system) is working correctly.
This Energy Report must not be used in situations where an Energy Performance Certificate (EPC) is required.
This Energy Report is generated from a set of data inputs which may not reflect the actual dimensions, services or construction of the dwelling.
The calculation used to generate this report reflects the SAP Methodology current at the time of report generation.

Glossary terms for additional metrics

Primary Energy	The measure of the energy required for lighting, heating and hot water in a property. This includes the efficiency of the property's heating system, power station efficiency for electricity and the energy used to produce the fuel and deliver it to the property.
Energy Used	The estimated amount of fuel energy for lighting, heating and hot water for the property. The estimate is based on typical usage which is likely to be different to actual consumption.
Carbon (CO2)	The current emissions based on the energy estimates.
Cost	The estimated cost of energy. The cost of each unit of fuel is based on an industry standard which is likely to be different to those the occupier actually pays.
Heat Transfer Coefficient	Heat flow through the property envelope where internal and external temperatures are different.

Building Regulations England Part L (BREL) Compliance Report

Approved Document L1 2021 Edition, England assessed by Array SAP 10 program, Array

Date: Fri 03 Oct 2025 15:03:28

Project Information			
Assessed By	Paul Goddard	Building Type	House, Mid-terrace
OCDEA Registration	EES/005113	Assessment Date	2025-10-03

Dwelling Details			
Assessment Type	As built	Total Floor Area	91 m^2
Site Reference	78449-12	Plot Reference	001
Address	832 Rochdale Road, MANCHESTER, M9 8FA		

Client Details	
Name	-
Company	John Southworth
Address	Unit 10, Charles Street, DUKINFIELD, SK16 4SD

This report covers items included within the SAP calculations. It is not a complete report of regulations compliance.

1a Target emission rate and dwelling emission rate		
Fuel for main heating system	Electricity	
Target carbon dioxide emission rate	*11.44 $kgCO_2/m^2$*	
Dwelling carbon dioxide emission rate	3.62 $kgCO_2/m^2$	**OK**
1b Target primary energy rate and dwelling primary energy		
Target primary energy	*59.93 kWh_{PE}/m^2*	
Dwelling primary energy	38.33 kWh_{PE}/m^2	**OK**
1c Target fabric energy efficiency and dwelling fabric energy efficiency		
Target fabric energy efficiency	*36.9 kWh/m^2*	
Dwelling fabric energy efficiency	34.1 kWh/m^2	**OK**

2a Fabric U-values				
Element	***Maximum permitted average U-Value [W/m^2K]***	**Dwelling average U-Value [W/m^2K]**	**Element with highest individual U-Value**	
External walls	*0.26*	0.13	Walls (1) (0.13)	**OK**
Party walls	*0.2*	0	Party Wall (1) (0)	**N/A**
Curtain walls	*1.6*	0	N/A	**N/A**
Floors	*0.18*	0.09	Exposed Floor (0.14)	**OK**
Roofs	*0.16*	0.13	Roof (1) (0.13)	**OK**
Windows, doors, and roof windows	*1.6*	0.87	Front (1)	**OK**
Rooflights	*2.2*	N/A	N/A	**N/A**

2b Envelope elements (better than typically expected values are flagged with a subsequent (!))		
Name	**Net area [m^2]**	**U-Value [W/m^2K]**
Exposed wall: Walls (1)	52.2	0.13 **(!)**
Party wall: Party Wall (1)	88.21	0 **(!)**
Ground floor: GF, GF	41.18	0.08 **(!)**
Upper floor: Exposed Floor, Exposed Floor	8.6	0.14
Exposed roof: Roof (1)	49.779998779296875	0.13

2c Openings (better than typically expected values are flagged with a subsequent (!))				
Name	**Area [m^2]**	**Orientation**	**Frame factor**	**U-Value [W/m^2K]**
Front, Door	1.99	East	N/A	1 **(!)**
Front, Window	4.98	East	1.0	0.8 **(!)**
Rear, Window	3.53	West	1.0	0.8 **(!)**
Rear, Door	2.15	West	N/A	1 **(!)**

2d Thermal bridging (better than typically expected values are flagged with a subsequent (!))				
Building part **1**: Thermal bridging calculated from linear thermal transmittances for each junction				
Main element	**Junction detail**	**Source**	**Psi value [W/mK]**	**Drawing / reference**
External wall	E2: Other lintels (including other steel lintels)	Calculated by person with suitable expertise	0.115	Thermal Bridge Report

Main element	Junction detail	Source	Psi value [W/mK]	Drawing / reference
External wall	E3: Sill	Calculated by person with suitable expertise	0.017 **(!)**	Thermal Bridge Report
External wall	E4: Jamb	Calculated by person with suitable expertise	0.094	Thermal Bridge Report
External wall	E5: Ground floor (normal)	Calculated by person with suitable expertise	0.067	Thermal Bridge Report
External wall	E16: Corner (normal)	Calculated by person with suitable expertise	0.068	Thermal Bridge Report
External wall	E12: Gable (insulation at ceiling level)	Calculated by person with suitable expertise	0.077	Thermal Bridge Report
External wall	E6: Intermediate floor within a dwelling	Calculated by person with suitable expertise	0.032 **(!)**	Thermal Bridge Report
External wall	E17: Corner (inverted - internal area greater than external area)	Calculated by person with suitable expertise	-0.029 **(!)**	Thermal Bridge Report
Party wall	P1: Ground floor	SAP table default	0.32	K1
External wall	E20: Exposed floor (normal)	Calculated by person with suitable expertise	0.079	Thermal Bridge Report
External wall	E21: Exposed floor (inverted)	Calculated by person with suitable expertise	0.063	Thermal Bridge Report
External wall	E18: Party wall between dwellings	Calculated by person with suitable expertise	0.092	Thermal Bridge Report
Party wall	P4: Roof (insulation at ceiling level)	Calculated by person with suitable expertise	0.102	Thermal Bridge Report

3 Air permeability (better than typically expected values are flagged with a subsequent (!))		
Maximum permitted air permeability at 50Pa	*8 m^3/hm^2*	
Dwelling air permeability at 50Pa	5 m^3/hm^2, Measured value	OK
Air permeability test certificate reference		

4 Space heating	
Main heating system 1: Heat pump with radiators or underfloor heating - Electricity	
Efficiency	270.7%
Emitter type	Radiators
Flow temperature	45°C
System type	
Manufacturer	Daikin Europe NV
Model	EDLA09DA3V3
Commissioning	
Secondary heating system: N/A	
Fuel	N/A
Efficiency	N/A
Commissioning	

5 Hot water	
Cylinder/store - type: Cylinder	
Capacity	210 litres
Declared heat loss	1.58 kWh/day
Primary pipework insulated	Yes
Manufacturer	
Model	
Commissioning	
Waste water heat recovery system 1 - type: N/A	
Efficiency	
Manufacturer	
Model	

6 Controls	
Main heating 1 - type: Programmer, room thermostat and TRVs	
Function	
Ecodesign class	
Manufacturer	
Model	

Water heating - type: Cylinder thermostat and HW separately timed	
Manufacturer	
Model	

7 Lighting		
Minimum permitted light source efficacy	*75 lm/W*	
Lowest light source efficacy	80 lm/W	OK
External lights control	N/A	

8 Mechanical ventilation		
System type: Balanced whole-house mechanical ventilation with heat recovery		
Maximum permitted specific fan power	*1.5 W/(l/s)*	
Specific fan power	0.85 W/(l/s)	OK
Minimum permitted heat recovery efficiency	*73%*	
Heat recovery efficiency	90%	OK
Manufacturer/Model	DV110 Adroit	
Commissioning		

9 Local generation
N/A

10 Heat networks
N/A

11 Supporting documentary evidence	
Documentary evidence identified in 11.1 and 11.2 is needed to confirm the data values used for any calculations undertaken, manufacturer declarations made, and tests performed as reflected in this "As built" BREL Compliance Report are correct. 11.1 SAP Conventions, Appendix 1 (documentary evidence) schedules the minimum documentary evidence required. 11.2 Indicative photographic evidence of key stages during construction (guidance within Approved Document L, Volume 1 – Appendix B) that confirms the products identified in this BREL Compliance Report are used in this dwelling, and workmanship is of sufficient quality to support the calculated values claimed in 2a to 2d.	

12 Declarations	
a. Assessor Declaration	
This declaration by the assessor is confirmation that the contents of this BREL Compliance Report are a true and accurate reflection based upon the design and construction information submitted for this dwelling for the purpose of carrying out the assessment, and that the supporting documentary evidence (identified in 11.1 and 11.2) pursuant to Part L of the Building Regulations 2010 (as amended) has been reviewed in the course of preparing this BREL Compliance Report.	
Signed: Name:	Assessor ID: Date:
b. Client Declaration	
This declaration by the client is confirmation that the dwelling has been constructed and completed according to the specifications set out in this BREL Compliance Report, and that photographic evidence of key stages, as described in 11.2, has been provided to the Assessor for this dwelling.	
Signed: Name:	Organisation: Date:

Full SAP Calculation Printout

Property Reference	78449-12	**Issued on Date**	03/10/2025
Assessment Reference	001	**Prop Type Ref**	Mid
Property	832 Rochdale Road, MANCHESTER, M9 8FA		

SAP Rating	84 B	**DER**	3.62	**TER**	11.44
Environmental	97 A	**% DER < TER**			68.36
CO_2 Emissions (t/year)	0.32	**DFEE**	34.10	**TFEE**	36.90
Compliance Check	See BREL	**% DFEE < TFEE**			7.58
% DPER < TPER	36.04	**DPER**	38.33	**TPER**	59.93

Assessor Details	Mr. Daniel Goddard	**Assessor ID**	CP52-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	41.1800 (1b)	x	2.4800 (2b)	=	102.1264	(1b) - (3b)
First floor	49.7800 (1c)	x	2.7800 (2c)	=	138.3884	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	90.9600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	240.5148	(5)

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2. Ventilation rate

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			m3 per hour
Number of open chimneys		0 * 80 =	0.0000 (6a)
Number of open flues		0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000 (6d)
Number of flues attached to other heater		0 * 35 =	0.0000 (6e)
Number of blocked chimneys		0 * 20 =	0.0000 (6f)
Number of intermittent extract fans		0 * 10 =	0.0000 (7a)
Number of passive vents		0 * 10 =	0.0000 (7b)
Number of flueless gas fires		0 * 40 =	0.0000 (7c)
			Air changes per hour
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		0.0000 / (5) =	0.0000 (8)
Pressure test			Yes
Pressure Test Method			Blower Door
Measured/design AP50			5.0000 (17)
Infiltration rate			0.2500 (18)
Number of sides sheltered			2 (19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.2125 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2709	0.2656	0.2603	0.2338	0.2284	0.2019	0.2019	0.1966	0.2125	0.2284	0.2391	0.2497	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =		81.0000 (23c)

Effective ac	0.3659	0.3606	0.3553	0.3287	0.3234	0.2969	0.2969	0.2916	0.3075	0.3234	0.3341	0.3447	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door			4.1400	1.0000	4.1400			(26)
Window			8.5100	0.7752	6.5969			(27)
GF			41.1800	0.0800	3.2944	75.0000	3088.5000	(28a)
Exposed Floor			8.6000	0.1400	1.2040	20.0000	172.0000	(28b)
Main	64.8536	12.6500	52.2036	0.1300	6.7865	9.0000	469.8324	(29a)
PIJ	49.7800		49.7800	0.1300	6.4714	9.0000	448.0200	(30)
Total net area of external elements Aum(A, m2)			164.4136					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		28.4932			(33)
Main dwelling								
Party Wall 1			88.2100	0.0000	0.0000	20.0000	1764.2000	(32)
Timber			96.4800			9.0000	868.3200	(32c)
FF			41.1800			18.0000	741.2400	(32d)
GF			41.1800			9.0000	370.6200	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 7922.7324 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 87.1013 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	8.6300	0.1150	0.9925
E3 Sill	8.6300	0.0170	0.1467
E4 Jamb	28.2000	0.0940	2.6508
E5 Ground floor (normal)	13.8200	0.0670	0.9259
E16 Corner (normal)	4.9600	0.0680	0.3373
E12 Gable (insulation at ceiling level)	11.0000	0.0770	0.8470
E6 Intermediate floor within a dwelling	11.0000	0.0320	0.3520
E17 Corner (inverted - internal area greater than external area)	4.9600	-0.0290	-0.1438
P1 Party wall - Ground floor	15.2800	0.3200	4.8896
E20 Exposed floor (normal)	6.4400	0.0790	0.5088
E21 Exposed floor (inverted)	12.0800	0.0630	0.7610
E18 Party wall between dwellings	21.0400	0.0920	1.9357
P4 Party wall - Roof (insulation at ceiling level)	18.1000	0.1020	1.8462

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 16.0496 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 44.5428 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	29.0444	28.6228	28.2011	26.0928	25.6712	23.5629	23.5629	23.1413	24.4062	25.6712	26.5145	27.3578	(38)
Heat transfer coeff	73.5872	73.1656	72.7439	70.6356	70.2140	68.1057	68.1057	67.6841	68.9490	70.2140	71.0573	71.9006	(39)
Average = Sum(39)m / 12 =												70.5302	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8090	0.8044	0.7997	0.7766	0.7719	0.7487	0.7487	0.7441	0.7580	0.7719	0.7812	0.7905	(40)
HLP (average)												0.7754	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6386 (42)
Hot water usage for mixer showers

68.4610	67.4321	65.9329	63.0644	60.9476	58.5869	57.2450	58.7329	60.3639	62.8986	65.8287	68.1987	(42a)

Hot water usage for baths

29.5637	29.1246	28.5063	27.3663	26.5127	25.5661	25.0549	25.6688	26.3373	27.3502	28.5137	29.4637	(42b)

Hot water usage for other uses

41.6522	40.1376	38.6230	37.1084	35.5937	34.0791	34.0791	35.5937	37.1084	38.6230	40.1376	41.6522	(42c)

Average daily hot water use (litres/day) 128.3946 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	139.6769	136.6944	133.0622	127.5391	123.0540	118.2321	116.3790	119.9955	123.8096	128.8717	134.4799	139.3147	(44)
Energy conte	221.2141	194.6510	204.5117	174.5947	165.6543	145.3802	140.7503	148.5795	152.6696	174.8777	191.5913	218.1331	(45)
Energy content (annual)										Total = Sum(45)m =		2132.6075	

Distribution loss (46)m = 0.15 x (45)m

33.1821	29.1976	30.6768	26.1892	24.8482	21.8070	21.1126	22.2869	22.9004	26.2317	28.7387	32.7200	(46)

Water storage loss:
Store volume 210.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.5800 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.8532 (55)
Total storage loss

26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(56)

If cylinder contains dedicated solar storage

26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(57)
23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Primary loss
Combi loss
Total heat required for water heating calculated for each month

270.9257	239.5518	254.2233	222.7027	215.3659	193.4882	190.4619	198.2911	200.7776	224.5893	239.6993	267.8447	(62)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

WWHRS
PV diverter
Solar input
FGHRS
Output from w/h

270.9257	239.5518	254.2233	222.7027	215.3659	193.4882	190.4619	198.2911	200.7776	224.5893	239.6993	267.8447	(64)

Total per year (kWh/year) = Sum(64)m = 2717.9215 (64)
12Total per year (kWh/year) 2718 (64)
Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)
Heat gains from water heating, kWh/month

113.3230	100.6421	107.7694	96.5391	94.8493	86.8253	86.5688	89.1720	89.2490	97.9161	102.1905	112.2985	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	145.9975	161.6401	145.9975	150.8641	145.9975	150.8641	145.9975	145.9975	150.8641	145.9975	150.8641	145.9975	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	240.8328	243.3319	237.0343	223.6274	206.7036	190.7976	180.1714	177.6723	183.9699	197.3768	214.3007	230.2066	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	(71)
Water heating gains (Table 5)	152.3158	149.7650	144.8514	134.0821	127.4857	120.5907	116.3559	119.8548	123.9570	131.6077	141.9313	150.9389	(72)
Total internal gains	601.7256	617.3165	590.4626	571.1531	542.7662	524.8319	505.1042	506.1041	521.3705	537.5615	569.6755	589.7225	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a	g Specific data	FF Specific data	Access factor	Gains W

					W/m2	or Table 6b		or Table 6c		Table 6d			
East					4.9800	19.6403		0.3000	0.0000	0.7700		22.5938	(76)
West					3.5300	19.6403		0.3000	0.0000	0.7700		16.0153	(80)
Solar gains	38.6090	75.5274	124.3829	181.4051	222.3188	227.5828	216.6681	186.1147	144.6625	89.6197	48.1409	31.7502	(83)
Total gains	640.3346	692.8439	714.8456	752.5582	765.0850	752.4147	721.7724	692.2188	666.0330	627.1812	617.8164	621.4727	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	29.9068	30.0792	30.2535	31.1565	31.3436	32.3139	32.3139	32.5152	31.9186	31.3436	30.9716	30.6084	
alpha	2.9938	3.0053	3.0169	3.0771	3.0896	3.1543	3.1543	3.1677	3.1279	3.0896	3.0648	3.0406	
util living area	0.9265	0.9051	0.8739	0.8005	0.6927	0.5307	0.3996	0.4294	0.6194	0.8096	0.8956	0.9309	(86)
Living	19.2282	19.4614	19.7964	20.2867	20.6516	20.8954	20.9678	20.9595	20.8198	20.3698	19.7744	19.2315	
Non living	18.6144	18.8450	19.1745	19.6594	20.0000	20.2268	20.2808	20.2795	20.1607	19.7473	19.1690	18.6294	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.0936	19.4614	19.7964	20.2867	20.6516	20.8954	20.9678	20.9595	20.8198	20.3698	19.7744	19.4788	(87)
Th 2	20.2455	20.2495	20.2536	20.2737	20.2777	20.2980	20.2980	20.3020	20.2899	20.2777	20.2697	20.2616	(88)
util rest of house	0.9187	0.8951	0.8602	0.7788	0.6590	0.4827	0.3406	0.3702	0.5727	0.7849	0.8832	0.9236	(89)
MIT 2	19.4111	18.8450	19.1745	19.6594	20.0000	20.2268	20.2808	20.2795	20.1607	19.7473	19.1690	18.8577	(90)
Living area fraction										fLA = Living area / (4) =		0.3196	(91)
MIT	19.6292	19.0420	19.3732	19.8599	20.2082	20.4405	20.5004	20.4968	20.3713	19.9462	19.3625	19.0562	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6292	19.0420	19.3732	19.8599	20.2082	20.4405	20.5004	20.4968	20.3713	19.9462	19.3625	19.0562	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9114	0.8762	0.8417	0.7653	0.6556	0.4927	0.3579	0.3870	0.5783	0.7723	0.8653	0.9093	(94)
Useful gains	583.6055	607.0518	601.6955	575.9327	501.6028	370.7506	258.3504	267.9168	385.1931	484.3734	534.5741	565.0785	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1128.0364	1034.7055	936.4503	774.1591	597.3978	397.7702	265.6377	277.2882	432.4032	656.2346	871.3380	1068.1696	(97)
Space heating kWh	405.0565	287.3833	249.0575	142.7230	71.2714	0.0000	0.0000	0.0000	0.0000	127.8647	242.4700	374.2997	(98a)
Space heating requirement - total per year (kWh/year)												1900.1263	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	405.0565	287.3833	249.0575	142.7230	71.2714	0.0000	0.0000	0.0000	0.0000	127.8647	242.4700	374.2997	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1900.1263	
Space heating per m2											(98c) / (4) =	20.8897	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												270.7081	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	405.0565	287.3833	249.0575	142.7230	71.2714	0.0000	0.0000	0.0000	0.0000	127.8647	242.4700	374.2997	(98)
Space heating efficiency (main heating system 1)	270.7081	270.7081	270.7081	270.7081	270.7081	0.0000	0.0000	0.0000	0.0000	270.7081	270.7081	270.7081	(210)
Space heating fuel (main heating system)	149.6285	106.1598	92.0022	52.7221	26.3278	0.0000	0.0000	0.0000	0.0000	47.2334	89.5688	138.2669	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	270.9257	239.5518	254.2233	222.7027	215.3659	193.4882	190.4619	198.2911	200.7776	224.5893	239.6993	267.8447	(64)
Efficiency of water heater												281.1060	(216)
(217)m	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	(217)
Fuel for water heating, kWh/month	96.3785	85.2176	90.4368	79.2237	76.6138	68.8310	67.7545	70.5396	71.4242	79.8949	85.2701	95.2824	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	29.6563	26.7864	29.6563	28.6997	29.6563	28.6997	29.6563	29.6563	28.6997	29.6563	28.6997	29.6563	(231)
Lighting	30.8703	24.7653	22.2984	16.3368	12.6190	10.3098	11.5115	14.9631	19.4355	25.5005	28.8027	31.7283	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	701.9096	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	281.1060	
Water heating fuel used	966.8671	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.1900)		
mechanical ventilation fans (SFP = 1.1900)	349.1794	(230a)
Total electricity for the above, kWh/year	349.1794	(231)
Electricity for lighting (calculated in Appendix L)	249.1413	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2267.0974	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	701.9096	0.1552	108.9520	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	966.8671	0.1410	136.2905	(264)
Space and water heating			245.2426	(265)
Pumps, fans and electric keep-hot	349.1794	0.1387	48.4355	(267)
Energy for lighting	249.1413	0.1443	35.9588	(268)
Total CO2, kg/year			329.6368	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.6200	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	701.9096	1.5746	1105.2587	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	966.8671	1.5212	1470.8230	(278)
Space and water heating			2576.0817	(279)
Pumps, fans and electric keep-hot	349.1794	1.5128	528.2386	(281)
Energy for lighting	249.1413	1.5338	382.1413	(282)
Total Primary energy kWh/year			3486.4616	(286)
Dwelling Primary energy Rate (DPER)			38.3300	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	41.1800	(1b)	x 2.4800	(2b) =	102.1264	(1b) - (3b)
First floor	49.7800	(1c)	x 2.7800	(2c) =	138.3884	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	90.9600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		240.5148	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1247	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3747	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3185	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)

Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4061	0.3982	0.3902	0.3504	0.3424	0.3026	0.3026	0.2946	0.3185	0.3424	0.3583	0.3743 (22b)
Effective ac	0.5825	0.5793	0.5761	0.5614	0.5586	0.5458	0.5458	0.5434	0.5507	0.5586	0.5642	0.5700 (25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			4.1400	1.0000	4.1400			(26)
TER Opening Type			8.5100	1.1450	9.7443			(27)
GF			41.1800	0.1300	5.3534			(28a)
Exposed Floor			8.6000	0.1300	1.1180			(28b)
Main	64.8536	12.6500	52.2036	0.1800	9.3966			(29a)
PIJ	49.7800		49.7800	0.1100	5.4758			(30)
Total net area of external elements Aum(A, m2)			164.4136					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	35.2281			(33)
Main dwelling								
Party Wall 1			88.2100	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	87.1013	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	8.6300	0.0500	0.4315
E3 Sill	8.6300	0.0500	0.4315
E4 Jamb	28.2000	0.0500	1.4100
E5 Ground floor (normal)	13.8200	0.1600	2.2112
E16 Corner (normal)	4.9600	0.0900	0.4464
E12 Gable (insulation at ceiling level)	11.0000	0.0600	0.6600
E6 Intermediate floor within a dwelling	11.0000	0.0000	0.0000
E17 Corner (inverted - internal area greater than external area)	4.9600	-0.0900	-0.4464
P1 Party wall - Ground floor	15.2800	0.0800	1.2224
E20 Exposed floor (normal)	6.4400	0.3200	2.0608
E21 Exposed floor (inverted)	12.0800	0.3200	3.8656
E18 Party wall between dwellings	21.0400	0.0600	1.2624
P4 Party wall - Roof (insulation at ceiling level)	18.1000	0.1200	2.1720

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		15.7274	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	50.9555	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	46.2302	45.9760	45.7269	44.5568	44.3378	43.3187	43.3187	43.1299	43.7112	44.3378	44.7807	45.2438	(38)
Heat transfer coeff	97.1857	96.9316	96.6824	95.5123	95.2934	94.2742	94.2742	94.0855	94.6668	95.2934	95.7363	96.1993	(39)
Average = Sum(39)m / 12 =												95.5112	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0684	1.0657	1.0629	1.0500	1.0476	1.0364	1.0364	1.0344	1.0408	1.0476	1.0525	1.0576	(40)
HLP (average)												1.0500	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy											2.6386	(42)
Hot water usage for mixer showers	68.4610	67.4321	65.9329	63.0644	60.9476	58.5869	57.2450	58.7329	60.3639	62.8986	65.8287	68.1987 (42a)
Hot water usage for baths	29.5637	29.1246	28.5063	27.3663	26.5127	25.5661	25.0549	25.6688	26.3373	27.3502	28.5137	29.4637 (42b)
Hot water usage for other uses	41.6522	40.1376	38.6230	37.1084	35.5937	34.0791	34.0791	35.5937	37.1084	38.6230	40.1376	41.6522 (42c)
Average daily hot water use (litres/day)												128.3946 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	139.6769	136.6944	133.0622	127.5391	123.0540	118.2321	116.3790	119.9955	123.8096	128.8717	134.4799	139.3147	(44)
Energy conte	221.2141	194.6510	204.5117	174.5947	165.6543	145.3802	140.7503	148.5795	152.6696	174.8777	191.5913	218.1331	(45)
Energy content (annual)										Total = Sum(45)m =		2132.6075	
Distribution loss (46)m = 0.15 x (45)m	33.1821	29.1976	30.6768	26.1892	24.8482	21.8070	21.1126	22.2869	22.9004	26.2317	28.7387	32.7200	(46)
Water storage loss:													
Store volume												210.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7016	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.9188	(55)
Total storage loss	28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842	(56)
If cylinder contains dedicated solar storage	28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	272.9607	241.3898	256.2583	224.6720	217.4009	195.4575	192.4969	200.3261	202.7469	226.6243	241.6687	269.8797	(62)
WWHRS	-31.2975	-27.6798	-28.9847	-24.0004	-22.3675	-19.1401	-17.9408	-19.0782	-19.8031	-23.3456	-26.4477	-30.7179	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	241.6632	213.7101	227.2737	200.6716	195.0334	176.3175	174.5562	181.2479	182.9439	203.2787	215.2209	239.1618	(64)
										Total per year (kWh/year) = Sum(64)m =		2451.0786	(64)
12Total per year (kWh/year)												2451	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	114.9510	102.1125	109.3974	98.1146	96.4773	88.4008	88.1968	90.7999	90.8245	99.5441	103.7660	113.9265	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

(66)m	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	142.2156	157.4530	142.2156	146.9561	142.2156	146.9561	142.2156	142.2156	146.9561	142.2156	146.9561	142.2156	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	240.8328	243.3319	237.0343	223.6274	206.7036	190.7976	180.1714	177.6723	183.9699	197.3768	214.3007	230.2066	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	(71)
Water heating gains (Table 5)													
	154.5040	151.9532	147.0395	136.2703	129.6738	122.7789	118.5440	122.0429	126.1452	133.7959	144.1194	153.1270	(72)
Total internal gains													
	603.1319	618.3176	591.8689	572.4333	544.1725	523.1121	503.5105	504.5103	519.6507	538.9678	570.9557	591.1288	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	4.9800	19.6403	0.6300	0.7000	0.7700	29.8916	(76)
West	3.5300	19.6403	0.6300	0.7000	0.7700	21.1882	(80)

Solar gains	51.0797	99.9228	164.5586	239.9990	294.1277	301.0921	286.6519	246.2298	191.3885	118.5668	63.6904	42.0055	(83)
Total gains	654.2116	718.2404	756.4276	812.4323	838.3003	824.2042	790.1625	750.7401	711.0392	657.5346	634.6461	633.1343	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	22.6449	22.7043	22.7628	23.0416	23.0946	23.3442	23.3442	23.3911	23.2474	23.0946	22.9877	22.8771	
alpha	2.5097	2.5136	2.5175	2.5361	2.5396	2.5563	2.5563	2.5594	2.5498	2.5396	2.5325	2.5251	
util living area													
	0.9363	0.9179	0.8900	0.8294	0.7371	0.6002	0.4715	0.5071	0.6872	0.8450	0.9135	0.9408	(86)
MIT	18.4665	18.7376	19.1692	19.7832	20.3219	20.7241	20.8928	20.8676	20.5829	19.8994	19.1053	18.4305	(87)
Th 2	20.0267	20.0290	20.0312	20.0418	20.0438	20.0531	20.0531	20.0548	20.0495	20.0438	20.0398	20.0356	(88)
util rest of house													
	0.9284	0.9077	0.8757	0.8060	0.6983	0.5374	0.3858	0.4222	0.6306	0.8190	0.9010	0.9333	(89)
MIT 2	17.0633	17.4054	17.9489	18.7154	19.3635	19.8213	19.9856	19.9670	19.6760	18.8716	17.8806	17.0230	(90)
Living area fraction										fLA = Living area / (4) =		0.3196	(91)
MIT	17.5118	17.8312	18.3389	19.0566	19.6698	20.1098	20.2755	20.2548	19.9659	19.2001	18.2720	17.4728	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.5118	17.8312	18.3389	19.0566	19.6698	20.1098	20.2755	20.2548	19.9659	19.2001	18.2720	17.4728	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9004	0.8773	0.8442	0.7775	0.6812	0.5414	0.4069	0.4412	0.6251	0.7913	0.8712	0.9063	(94)
Useful gains	589.0216	630.1383	638.5494	631.6864	571.0784	446.2550	321.5222	331.1952	444.4610	520.3070	552.8988	573.8331	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1283.9967	1253.4418	1144.6149	970.0843	759.4665	519.4329	346.5070	362.6828	555.3014	819.5308	1069.5680	1276.8325	(97)
Space heating kWh													
	517.0614	418.8600	376.5127	243.6465	140.1607	0.0000	0.0000	0.0000	0.0000	222.6225	372.0018	523.0315	(98a)
Space heating requirement - total per year (kWh/year)												2813.8972	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	517.0614	418.8600	376.5127	243.6465	140.1607	0.0000	0.0000	0.0000	0.0000	222.6225	372.0018	523.0315	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2813.8972	
Space heating per m2											(98c) / (4) =	30.9355	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	517.0614	418.8600	376.5127	243.6465	140.1607	0.0000	0.0000	0.0000	0.0000	222.6225	372.0018	523.0315	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	560.1966	453.8028	407.9227	263.9724	151.8534	0.0000	0.0000	0.0000	0.0000	241.1945	403.0355	566.6647	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	241.6632	213.7101	227.2737	200.6716	195.0334	176.3175	174.5562	181.2479	182.9439	203.2787	215.2209	239.1618	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.7207	85.5407	85.1837	84.4960	83.3316	79.8000	79.8000	79.8000	79.8000	84.2641	85.2751	85.7649	(217)
Fuel for water heating, kWh/month													
	281.9193	249.8345	266.8041	237.4923	234.0450	220.9492	218.7421	227.1276	229.2530	241.2400	252.3842	278.8574	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)

Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	29.5496	23.7058	21.3444	15.6378	12.0791	9.8687	11.0190	14.3229	18.6040	24.4095	27.5704	30.3709	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-38.9812	-55.1702	-79.5760	-89.7571	-96.9883	-90.5718	-89.4598	-84.3870	-75.4216	-63.2498	-42.9366	-33.6769	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-21.3144	-44.9402	-89.5251	-134.7575	-178.4789	-179.4591	-177.3409	-150.0006	-109.7478	-64.3537	-28.4842	-16.8460	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	3048.6426	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2938.6486	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	238.4821	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-2035.4247	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	4276.3487	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3048.6426	0.2100	640.2150	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2938.6486	0.2100	617.1162	(264)
Space and water heating			1257.3312	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	238.4821	0.1443	34.4203	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-840.1762	0.1345	-113.0202	
PV Unit electricity exported	-1195.2485	0.1258	-150.3985	
Total			-263.4187	(269)
Total CO2, kg/year			1040.2621	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.4400	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	3048.6426	1.1300	3444.9662	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2938.6486	1.1300	3320.6730	(278)
Space and water heating			6765.6391	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	238.4821	1.5338	365.7919	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-840.1762	1.4972	-1257.8767	
PV Unit electricity exported	-1195.2485	0.4619	-552.0620	
Total			-1809.9387	(283)
Total Primary energy kWh/year			5451.5931	(286)
Target Primary Energy Rate (TPER)			59.9300	(287)

Full SAP Calculation Printout

Property Reference	78449-12	**Issued on Date**	03/10/2025
Assessment Reference	001	**Prop Type Ref**	Mid
Property	832 Rochdale Road, MANCHESTER, M9 8FA		

SAP Rating	84 B	**DER**	3.62	**TER**	11.44
Environmental	97 A	**% DER < TER**			68.36
CO_2 Emissions (t/year)	0.32	**DFEE**	34.10	**TFEE**	36.90
Compliance Check	See BREL	**% DFEE < TFEE**			7.58
% DPER < TPER	36.04	**DPER**	38.33	**TPER**	59.93

Assessor Details	Mr. Daniel Goddard	**Assessor ID**	CP52-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	41.1800 (1b)	x	2.4800 (2b)	=	102.1264	(1b) - (3b)
First floor	49.7800 (1c)	x	2.7800 (2c)	=	138.3884	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	90.9600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	240.5148	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1247	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3747	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3185	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4061	0.3982	0.3902	0.3504	0.3424	0.3026	0.3026	0.2946	0.3185	0.3424	0.3583	0.3743	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0.0000	(23c)

Effective ac	0.5825	0.5793	0.5761	0.5614	0.5586	0.5458	0.5458	0.5434	0.5507	0.5586	0.5642	0.5700	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door			4.1400	1.0000	4.1400			(26)
Window			8.5100	0.7752	6.5969			(27)
GF			41.1800	0.0800	3.2944	75.0000	3088.5000	(28a)
Exposed Floor			8.6000	0.1400	1.2040	20.0000	172.0000	(28b)
Main	64.8536	12.6500	52.2036	0.1300	6.7865	9.0000	469.8324	(29a)
PIJ	49.7800		49.7800	0.1300	6.4714	9.0000	448.0200	(30)
Total net area of external elements Aum(A, m2)			164.4136					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	28.4932			(33)
Main dwelling								
Party Wall 1			88.2100	0.0000	0.0000	20.0000	1764.2000	(32)
Timber			96.4800			9.0000	868.3200	(32c)
FF			41.1800			18.0000	741.2400	(32d)
GF			41.1800			9.0000	370.6200	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	7922.7324 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		87.1013 (35)
List of Thermal Bridges		

	Length	Psi-value	Total	
K1 Element				
E2 Other lintels (including other steel lintels)	8.6300	0.1150	0.9925	
E3 Sill	8.6300	0.0170	0.1467	
E4 Jamb	28.2000	0.0940	2.6508	
E5 Ground floor (normal)	13.8200	0.0670	0.9259	
E16 Corner (normal)	4.9600	0.0680	0.3373	
E12 Gable (insulation at ceiling level)	11.0000	0.0770	0.8470	
E6 Intermediate floor within a dwelling	11.0000	0.0320	0.3520	
E17 Corner (inverted - internal area greater than external area)	4.9600	-0.0290	-0.1438	
P1 Party wall - Ground floor	15.2800	0.3200	4.8896	
E20 Exposed floor (normal)	6.4400	0.0790	0.5088	
E21 Exposed floor (inverted)	12.0800	0.0630	0.7610	
E18 Party wall between dwellings	21.0400	0.0920	1.9357	
P4 Party wall - Roof (insulation at ceiling level)	18.1000	0.1020	1.8462	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			16.0496	(36)
Point Thermal bridges		(36a) =	0.0000	
Total fabric heat loss		(33) + (36) + (36a) =	44.5428	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	46.2302	45.9760	45.7269	44.5568	44.3378	43.3187	43.3187	43.1299	43.7112	44.3378	44.7807	45.2438	(38)
Heat transfer coeff	90.7730	90.5188	90.2697	89.0996	88.8806	87.8615	87.8615	87.6727	88.2540	88.8806	89.3235	89.7865	(39)
Average = Sum(39)m / 12 =												89.0985	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9979	0.9951	0.9924	0.9795	0.9771	0.9659	0.9659	0.9639	0.9703	0.9771	0.9820	0.9871	(40)
HLP (average)												0.9795	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy											2.6386	(42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	29.5637	29.1246	28.5063	27.3663	26.5127	25.5661	25.0549	25.6688	26.3373	27.3502	28.5137	29.4637	(42b)
Hot water usage for other uses	41.6522	40.1376	38.6230	37.1084	35.5937	34.0791	34.0791	35.5937	37.1084	38.6230	40.1376	41.6522	(42c)
Average daily hot water use (litres/day)												65.2759	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	71.2159	69.2622	67.1293	64.4747	62.1064	59.6452	59.1340	61.2626	63.4457	65.9732	68.6513	71.1160	(44)
Energy conte	112.7886	98.6285	103.1753	88.2626	83.6072	73.3408	71.5174	75.8559	78.2349	89.5249	97.8063	111.3504	(45)
Energy content (annual)										Total = Sum(45)m =		1084.0928	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	95.8703	83.8342	87.6990	75.0232	71.0661	62.3397	60.7898	64.4775	66.4996	76.0962	83.1354	94.6479	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	95.8703	83.8342	87.6990	75.0232	71.0661	62.3397	60.7898	64.4775	66.4996	76.0962	83.1354	94.6479	(64)
									Total per year (kWh/year) = Sum(64)m =			921.4789	(64)
12Total per year (kWh/year)												921	(64)
Electric shower(s)	54.8258	48.8503	53.3426	50.9042	51.8594	49.4688	51.1178	51.8594	50.9042	53.3426	52.3396	54.8258	(64a)
					Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =							623.6406	(64a)
Heat gains from water heating, kWh/month	37.6740	33.1711	35.2604	31.4819	30.7314	27.9521	27.9769	29.0842	29.3510	32.3597	33.8687	37.3684	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	145.9975	161.6401	145.9975	150.8641	145.9975	150.8641	145.9975	145.9975	150.8641	145.9975	150.8641	145.9975	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	240.8328	243.3319	237.0343	223.6274	206.7036	190.7976	180.1714	177.6723	183.9699	197.3768	214.3007	230.2066	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	(71)
Water heating gains (Table 5)	50.6372	49.3618	47.3930	43.7248	41.3056	38.8224	37.6034	39.0917	40.7652	43.4942	47.0399	50.2264	(72)
Total internal gains	500.0470	516.9133	493.0043	480.7957	456.5862	443.0635	426.3517	425.3410	438.1787	449.4480	474.7841	489.0100	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	4.9800	19.6403	0.3000	0.0000	0.7700	22.5938	(76)
West	3.5300	19.6403	0.3000	0.0000	0.7700	16.0153	(80)

Solar gains	38.6090	75.5274	124.3829	181.4051	222.3188	227.5828	216.6681	186.1147	144.6625	89.6197	48.1409	31.7502	(83)

Total gains	538.6560	592.4407	617.3872	662.2009	678.9049	670.6464	643.0199	611.4557	582.8412	539.0677	522.9250	520.7602	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	24.2446	24.3127	24.3798	24.7000	24.7608	25.0481	25.0481	25.1020	24.9366	24.7608	24.6381	24.5110	
alpha	2.6163	2.6208	2.6253	2.6467	2.6507	2.6699	2.6699	2.6735	2.6624	2.6507	2.6425	2.6341	
util living area	0.9559	0.9417	0.9214	0.8722	0.7931	0.6608	0.5283	0.5653	0.7427	0.8840	0.9385	0.9594	(86)
MIT	18.4198	18.6789	19.0881	19.7002	20.2511	20.6888	20.8776	20.8494	20.5410	19.8360	19.0522	18.3883	(87)
Th 2	20.0850	20.0874	20.0897	20.1004	20.1024	20.1118	20.1118	20.1136	20.1082	20.1024	20.0984	20.0941	(88)
util rest of house	0.9503	0.9342	0.9107	0.8536	0.7597	0.6014	0.4422	0.4812	0.6918	0.8635	0.9294	0.9542	(89)
MIT 2	17.7111	17.9680	18.3730	18.9767	19.5019	19.9005	20.0485	20.0317	19.7770	19.1170	18.3471	17.6860	(90)
Living area fraction										fLA = Living area / (4) =		0.3196	(91)
MIT	17.9375	18.1952	18.6016	19.2080	19.7413	20.1525	20.3135	20.2930	20.0212	19.3468	18.5724	17.9105	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.9375	18.1952	18.6016	19.2080	19.7413	20.1525	20.3135	20.2930	20.0212	19.3468	18.5724	17.9105	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9326	0.9142	0.8887	0.8315	0.7445	0.6044	0.4629	0.4994	0.6862	0.8424	0.9094	0.9374	(94)
Useful gains	502.3694	541.5870	548.6931	550.6202	505.4243	405.3280	297.6315	305.3646	399.9404	454.1350	475.5614	488.1676	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1237.9208	1203.4648	1092.4050	918.4345	714.7182	487.8473	326.2740	341.3136	522.5687	777.4204	1024.7572	1231.0144	(97)
Space heating kWh	547.2502	444.7819	404.5217	264.8262	155.7146	0.0000	0.0000	0.0000	0.0000	240.5244	395.4210	552.6780	(98a)
Space heating requirement - total per year (kWh/year)												3005.7180	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	547.2502	444.7819	404.5217	264.8262	155.7146	0.0000	0.0000	0.0000	0.0000	240.5244	395.4210	552.6780	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3005.7180	
Space heating per m2											(98c) / (4) =	33.0444	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	825.8978	650.1748	666.3128	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.6697	0.7435	0.7164	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	553.1317	483.4155	477.3560	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	708.6181	679.8104	645.9957	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	111.9502	146.1178	125.4679	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	27.9876	36.5295	31.3670	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												95.8840	(107)
Energy for space heating												33.0444	(99)
Energy for space cooling												1.0541	(108)
Total												34.0985	(109)
Fabric Energy Efficiency (DFEE)												34.1	(109)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	41.1800	(1b) x	2.4800	(2b) =	102.1264	(1b) - (3b)
First floor	49.7800	(1c) x	2.7800	(2c) =	138.3884	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	90.9600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		240.5148	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)

Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1247 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3747 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3185 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4061	0.3982	0.3902	0.3504	0.3424	0.3026	0.3026	0.2946	0.3185	0.3424	0.3583	0.3743	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5825	0.5793	0.5761	0.5614	0.5586	0.5458	0.5458	0.5434	0.5507	0.5586	0.5642	0.5700	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			4.1400	1.0000	4.1400			(26)
TER Opening Type			8.5100	1.1450	9.7443			(27)
GF			41.1800	0.1300	5.3534			(28a)
Exposed Floor			8.6000	0.1300	1.1180			(28b)
Main	64.8536	12.6500	52.2036	0.1800	9.3966			(29a)
PIJ	49.7800		49.7800	0.1100	5.4758			(30)
Total net area of external elements Aum(A, m2)			164.4136					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		35.2281			(33)
Main dwelling								
Party Wall 1			88.2100	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	87.1013 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	8.6300	0.0500	0.4315
E3 Sill	8.6300	0.0500	0.4315
E4 Jamb	28.2000	0.0500	1.4100
E5 Ground floor (normal)	13.8200	0.1600	2.2112
E16 Corner (normal)	4.9600	0.0900	0.4464
E12 Gable (insulation at ceiling level)	11.0000	0.0600	0.6600
E6 Intermediate floor within a dwelling	11.0000	0.0000	0.0000
E17 Corner (inverted - internal area greater than external area)	4.9600	-0.0900	-0.4464
P1 Party wall - Ground floor	15.2800	0.0800	1.2224
E20 Exposed floor (normal)	6.4400	0.3200	2.0608
E21 Exposed floor (inverted)	12.0800	0.3200	3.8656
E18 Party wall between dwellings	21.0400	0.0600	1.2624
P4 Party wall - Roof (insulation at ceiling level)	18.1000	0.1200	2.1720

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		15.7274 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	50.9555 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	46.2302	45.9760	45.7269	44.5568	44.3378	43.3187	43.3187	43.1299	43.7112	44.3378	44.7807	45.2438	(38)
Heat transfer coeff	97.1857	96.9316	96.6824	95.5123	95.2934	94.2742	94.2742	94.0855	94.6668	95.2934	95.7363	96.1993	(39)
Average = Sum(39)m / 12 =												95.5112	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0684	1.0657	1.0629	1.0500	1.0476	1.0364	1.0364	1.0344	1.0408	1.0476	1.0525	1.0576	(40)
HLP (average)												1.0500	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.6386 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

29.5637	29.1246	28.5063	27.3663	26.5127	25.5661	25.0549	25.6688	26.3373	27.3502	28.5137	29.4637	(42b)

Hot water usage for other uses

41.6522	40.1376	38.6230	37.1084	35.5937	34.0791	34.0791	35.5937	37.1084	38.6230	40.1376	41.6522	(42c)

Average daily hot water use (litres/day)	65.2759 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	71.2159	69.2622	67.1293	64.4747	62.1064	59.6452	59.1340	61.2626	63.4457	65.9732	68.6513	71.1160	(44)
Energy conte	112.7886	98.6285	103.1753	88.2626	83.6072	73.3408	71.5174	75.8559	78.2349	89.5249	97.8063	111.3504	(45)
Energy content (annual)										Total = Sum(45)m =		1084.0928	
Distribution loss (46)m = 0.15 x (45)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	95.8703	83.8342	87.6990	75.0232	71.0661	62.3397	60.7898	64.4775	66.4996	76.0962	83.1354	94.6479	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													

	95.8703	83.8342	87.6990	75.0232	71.0661	62.3397	60.7898	64.4775	66.4996	76.0962	83.1354	94.6479 (64)
									Total per year (kWh/year) = Sum(64)m =			921.4789 (64)
12Total per year (kWh/year)												921 (64)
Electric shower(s)												
	54.8258	48.8503	53.3426	50.9042	51.8594	49.4688	51.1178	51.8594	50.9042	53.3426	52.3396	54.8258 (64a)
								Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =				623.6406 (64a)
Heat gains from water heating, kWh/month												
	37.6740	33.1711	35.2604	31.4819	30.7314	27.9521	27.9769	29.0842	29.3510	32.3597	33.8687	37.3684 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	142.2156	157.4530	142.2156	146.9561	142.2156	146.9561	142.2156	142.2156	146.9561	142.2156	146.9561	142.2156	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	240.8328	243.3319	237.0343	223.6274	206.7036	190.7976	180.1714	177.6723	183.9699	197.3768	214.3007	230.2066	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	(71)
Water heating gains (Table 5)													
	50.6372	49.3618	47.3930	43.7248	41.3056	38.8224	37.6034	39.0917	40.7652	43.4942	47.0399	50.2264	(72)
Total internal gains													
	496.2651	512.7262	489.2224	476.8878	452.8043	439.1556	422.5699	421.5591	434.2708	445.6662	470.8762	485.2281	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	4.9800	19.6403	0.6300	0.7000	0.7700	29.8916	(76)
West	3.5300	19.6403	0.6300	0.7000	0.7700	21.1882	(80)

Solar gains	51.0797	99.9228	164.5586	239.9990	294.1277	301.0921	286.6519	246.2298	191.3885	118.5668	63.6904	42.0055	(83)
Total gains	547.3448	612.6490	653.7810	716.8868	746.9320	740.2477	709.2218	667.7889	625.6593	564.2330	534.5666	527.2336	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	22.6449	22.7043	22.7628	23.0416	23.0946	23.3442	23.3442	23.3911	23.2474	23.0946	22.9877	22.8771	
alpha	2.5097	2.5136	2.5175	2.5361	2.5396	2.5563	2.5563	2.5594	2.5498	2.5396	2.5325	2.5251	
util living area													
	0.9557	0.9398	0.9161	0.8613	0.7758	0.6421	0.5125	0.5525	0.7336	0.8808	0.9381	0.9594	(86)
MIT	18.2422	18.5281	18.9823	19.6407	20.2246	20.6750	20.8697	20.8378	20.5077	19.7511	18.9079	18.2044	(87)
Th 2	20.0267	20.0290	20.0312	20.0418	20.0438	20.0531	20.0531	20.0548	20.0495	20.0438	20.0398	20.0356	(88)
util rest of house													
	0.9499	0.9319	0.9044	0.8408	0.7395	0.5795	0.4228	0.4645	0.6796	0.8590	0.9287	0.9540	(89)
MIT 2	17.4981	17.7812	18.2298	18.8766	19.4303	19.8370	19.9879	19.9692	19.6997	18.9942	18.1669	17.4665	(90)
Living area fraction										fLA = Living area / (4) =		0.3196	(91)
MIT	17.7359	18.0199	18.4703	19.1208	19.6841	20.1048	20.2697	20.2468	19.9579	19.2361	18.4037	17.7023	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.7359	18.0199	18.4703	19.1208	19.6841	20.1048	20.2697	20.2468	19.9579	19.2361	18.4037	17.7023	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9312	0.9105	0.8807	0.8173	0.7241	0.5832	0.4446	0.4836	0.6738	0.8365	0.9075	0.9364	(94)
Useful gains	509.7024	557.7967	575.7672	585.8931	540.8308	431.7068	315.2887	322.9581	421.5423	471.9565	485.1347	493.6945	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1305.7780	1271.7336	1157.3180	976.2114	760.8353	518.9595	345.9597	361.9301	554.5528	822.9632	1082.1775	1298.9102	(97)
Space heating kWh													
	592.2802	479.7656	432.6738	281.0292	163.6834	0.0000	0.0000	0.0000	0.0000	261.1490	429.8708	599.0805	(98a)
Space heating requirement - total per year (kWh/year)												3239.5326	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	592.2802	479.7656	432.6738	281.0292	163.6834	0.0000	0.0000	0.0000	0.0000	261.1490	429.8708	599.0805	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3239.5326	
Space heating per m2											(98c) / (4) =	35.6149	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	886.1775	697.6291	715.0496	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.6784	0.7494	0.7194	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	601.1936	522.8145	514.4272	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	794.2071	761.2522	715.7953	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	138.9697	177.3976	149.8178	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)

Space cooling kWh

0.0000	0.0000	0.0000	0.0000	0.0000	34.7424	44.3494	37.4545	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement											116.5463 (107)
Energy for space heating											35.6149 (99)
Energy for space cooling											1.2813 (108)
Total											36.8962 (109)
Fabric Energy Efficiency (TFEE)											36.9 (109)

Full SAP Calculation Printout

Property Reference	78449-12	**Issued on Date**	03/10/2025
Assessment Reference	001	**Prop Type Ref**	Mid
Property	832 Rochdale Road, MANCHESTER, M9 8FA		

SAP Rating	84 B	**DER**	3.62	**TER**	11.44
Environmental	97 A	**% DER < TER**			68.36
CO_2 Emissions (t/year)	0.32	**DFEE**	34.10	**TFEE**	36.90
Compliance Check	See BREL	**% DFEE < TFEE**			7.58
% DPER < TPER	36.04	**DPER**	38.33	**TPER**	59.93

Assessor Details	Mr. Daniel Goddard	**Assessor ID**	CP52-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	41.1800 (1b)	x	2.4800 (2b)	=	102.1264	(1b) - (3b)
First floor	49.7800 (1c)	x	2.7800 (2c)	=	138.3884	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	90.9600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	240.5148	(5)

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2. Ventilation rate

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			m3 per hour
Number of open chimneys		0 * 80 =	0.0000 (6a)
Number of open flues		0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000 (6d)
Number of flues attached to other heater		0 * 35 =	0.0000 (6e)
Number of blocked chimneys		0 * 20 =	0.0000 (6f)
Number of intermittent extract fans		0 * 10 =	0.0000 (7a)
Number of passive vents		0 * 10 =	0.0000 (7b)
Number of flueless gas fires		0 * 40 =	0.0000 (7c)
			Air changes per hour
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		0.0000 / (5) =	0.0000 (8)
Pressure test			Yes
Pressure Test Method			Blower Door
Measured/design AP50			5.0000 (17)
Infiltration rate			0.2500 (18)
Number of sides sheltered			2 (19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.2125 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2709	0.2656	0.2603	0.2338	0.2284	0.2019	0.2019	0.1966	0.2125	0.2284	0.2391	0.2497	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =		81.0000 (23c)

Effective ac	0.3659	0.3606	0.3553	0.3287	0.3234	0.2969	0.2969	0.2916	0.3075	0.3234	0.3341	0.3447	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door			4.1400	1.0000	4.1400			(26)
Window			8.5100	0.7752	6.5969			(27)
GF			41.1800	0.0800	3.2944	75.0000	3088.5000	(28a)
Exposed Floor			8.6000	0.1400	1.2040	20.0000	172.0000	(28b)
Main	64.8536	12.6500	52.2036	0.1300	6.7865	9.0000	469.8324	(29a)
PIJ	49.7800		49.7800	0.1300	6.4714	9.0000	448.0200	(30)
Total net area of external elements Aum(A, m2)			164.4136					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		28.4932			(33)
Main dwelling								
Party Wall 1			88.2100	0.0000	0.0000	20.0000	1764.2000	(32)
Timber			96.4800			9.0000	868.3200	(32c)
FF			41.1800			18.0000	741.2400	(32d)
GF			41.1800			9.0000	370.6200	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 7922.7324 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 87.1013 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	8.6300	0.1150	0.9925
E3 Sill	8.6300	0.0170	0.1467
E4 Jamb	28.2000	0.0940	2.6508
E5 Ground floor (normal)	13.8200	0.0670	0.9259
E16 Corner (normal)	4.9600	0.0680	0.3373
E12 Gable (insulation at ceiling level)	11.0000	0.0770	0.8470
E6 Intermediate floor within a dwelling	11.0000	0.0320	0.3520
E17 Corner (inverted - internal area greater than external area)	4.9600	-0.0290	-0.1438
P1 Party wall - Ground floor	15.2800	0.3200	4.8896
E20 Exposed floor (normal)	6.4400	0.0790	0.5088
E21 Exposed floor (inverted)	12.0800	0.0630	0.7610
E18 Party wall between dwellings	21.0400	0.0920	1.9357
P4 Party wall - Roof (insulation at ceiling level)	18.1000	0.1020	1.8462

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 16.0496 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 44.5428 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	29.0444	28.6228	28.2011	26.0928	25.6712	23.5629	23.5629	23.1413	24.4062	25.6712	26.5145	27.3578	(38)
Heat transfer coeff	73.5872	73.1656	72.7439	70.6356	70.2140	68.1057	68.1057	67.6841	68.9490	70.2140	71.0573	71.9006	(39)
Average = Sum(39)m / 12 =												70.5302	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8090	0.8044	0.7997	0.7766	0.7719	0.7487	0.7487	0.7441	0.7580	0.7719	0.7812	0.7905	(40)
HLP (average)												0.7754	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6386 (42)
Hot water usage for mixer showers

68.4610	67.4321	65.9329	63.0644	60.9476	58.5869	57.2450	58.7329	60.3639	62.8986	65.8287	68.1987	(42a)

Hot water usage for baths

29.5637	29.1246	28.5063	27.3663	26.5127	25.5661	25.0549	25.6688	26.3373	27.3502	28.5137	29.4637	(42b)

Hot water usage for other uses

41.6522	40.1376	38.6230	37.1084	35.5937	34.0791	34.0791	35.5937	37.1084	38.6230	40.1376	41.6522	(42c)

Average daily hot water use (litres/day) 128.3946 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	139.6769	136.6944	133.0622	127.5391	123.0540	118.2321	116.3790	119.9955	123.8096	128.8717	134.4799	139.3147	(44)
Energy conte	221.2141	194.6510	204.5117	174.5947	165.6543	145.3802	140.7503	148.5795	152.6696	174.8777	191.5913	218.1331	(45)
Energy content (annual)										Total = Sum(45)m =		2132.6075	

Distribution loss (46)m = 0.15 x (45)m

33.1821	29.1976	30.6768	26.1892	24.8482	21.8070	21.1126	22.2869	22.9004	26.2317	28.7387	32.7200	(46)

Water storage loss:
Store volume 210.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.5800 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.8532 (55)
Total storage loss

26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(56)

If cylinder contains dedicated solar storage

26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(57)
23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Primary loss
Combi loss
Total heat required for water heating calculated for each month

270.9257	239.5518	254.2233	222.7027	215.3659	193.4882	190.4619	198.2911	200.7776	224.5893	239.6993	267.8447	(62)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

WWHRS
PV diverter
Solar input
FGHRS
Output from w/h

270.9257	239.5518	254.2233	222.7027	215.3659	193.4882	190.4619	198.2911	200.7776	224.5893	239.6993	267.8447	(64)

Total per year (kWh/year) = Sum(64)m = 2717.9215 (64)
12Total per year (kWh/year) 2718 (64)
Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)
Heat gains from water heating, kWh/month

113.3230	100.6421	107.7694	96.5391	94.8493	86.8253	86.5688	89.1720	89.2490	97.9161	102.1905	112.2985	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	145.9975	161.6401	145.9975	150.8641	145.9975	150.8641	145.9975	145.9975	150.8641	145.9975	150.8641	145.9975	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	240.8328	243.3319	237.0343	223.6274	206.7036	190.7976	180.1714	177.6723	183.9699	197.3768	214.3007	230.2066	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	(71)
Water heating gains (Table 5)	152.3158	149.7650	144.8514	134.0821	127.4857	120.5907	116.3559	119.8548	123.9570	131.6077	141.9313	150.9389	(72)
Total internal gains	601.7256	617.3165	590.4626	571.1531	542.7662	524.8319	505.1042	506.1041	521.3705	537.5615	569.6755	589.7225	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a	g Specific data	FF Specific data	Access factor	Gains W

					W/m2	or Table 6b		or Table 6c		Table 6d			
East					4.9800	19.6403		0.3000	0.0000	0.7700		22.5938	(76)
West					3.5300	19.6403		0.3000	0.0000	0.7700		16.0153	(80)
Solar gains	38.6090	75.5274	124.3829	181.4051	222.3188	227.5828	216.6681	186.1147	144.6625	89.6197	48.1409	31.7502	(83)
Total gains	640.3346	692.8439	714.8456	752.5582	765.0850	752.4147	721.7724	692.2188	666.0330	627.1812	617.8164	621.4727	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	29.9068	30.0792	30.2535	31.1565	31.3436	32.3139	32.3139	32.5152	31.9186	31.3436	30.9716	30.6084	
alpha	2.9938	3.0053	3.0169	3.0771	3.0896	3.1543	3.1543	3.1677	3.1279	3.0896	3.0648	3.0406	
util living area	0.9265	0.9051	0.8739	0.8005	0.6927	0.5307	0.3996	0.4294	0.6194	0.8096	0.8956	0.9309	(86)
Living	19.2282	19.4614	19.7964	20.2867	20.6516	20.8954	20.9678	20.9595	20.8198	20.3698	19.7744	19.2315	
Non living	18.6144	18.8450	19.1745	19.6594	20.0000	20.2268	20.2808	20.2795	20.1607	19.7473	19.1690	18.6294	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.0936	19.4614	19.7964	20.2867	20.6516	20.8954	20.9678	20.9595	20.8198	20.3698	19.7744	19.4788	(87)
Th 2	20.2455	20.2495	20.2536	20.2737	20.2777	20.2980	20.2980	20.3020	20.2899	20.2777	20.2697	20.2616	(88)
util rest of house	0.9187	0.8951	0.8602	0.7788	0.6590	0.4827	0.3406	0.3702	0.5727	0.7849	0.8832	0.9236	(89)
MIT 2	19.4111	18.8450	19.1745	19.6594	20.0000	20.2268	20.2808	20.2795	20.1607	19.7473	19.1690	18.8577	(90)
Living area fraction										fLA = Living area / (4) =		0.3196	(91)
MIT	19.6292	19.0420	19.3732	19.8599	20.2082	20.4405	20.5004	20.4968	20.3713	19.9462	19.3625	19.0562	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6292	19.0420	19.3732	19.8599	20.2082	20.4405	20.5004	20.4968	20.3713	19.9462	19.3625	19.0562	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9114	0.8762	0.8417	0.7653	0.6556	0.4927	0.3579	0.3870	0.5783	0.7723	0.8653	0.9093	(94)
Useful gains	583.6055	607.0518	601.6955	575.9327	501.6028	370.7506	258.3504	267.9168	385.1931	484.3734	534.5741	565.0785	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1128.0364	1034.7055	936.4503	774.1591	597.3978	397.7702	265.6377	277.2882	432.4032	656.2346	871.3380	1068.1696	(97)
Space heating kWh	405.0565	287.3833	249.0575	142.7230	71.2714	0.0000	0.0000	0.0000	0.0000	127.8647	242.4700	374.2997	(98a)
Space heating requirement - total per year (kWh/year)												1900.1263	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	405.0565	287.3833	249.0575	142.7230	71.2714	0.0000	0.0000	0.0000	0.0000	127.8647	242.4700	374.2997	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1900.1263	
Space heating per m2											(98c) / (4) =	20.8897	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												270.7081	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	405.0565	287.3833	249.0575	142.7230	71.2714	0.0000	0.0000	0.0000	0.0000	127.8647	242.4700	374.2997	(98)
Space heating efficiency (main heating system 1)	270.7081	270.7081	270.7081	270.7081	270.7081	0.0000	0.0000	0.0000	0.0000	270.7081	270.7081	270.7081	(210)
Space heating fuel (main heating system)	149.6285	106.1598	92.0022	52.7221	26.3278	0.0000	0.0000	0.0000	0.0000	47.2334	89.5688	138.2669	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	270.9257	239.5518	254.2233	222.7027	215.3659	193.4882	190.4619	198.2911	200.7776	224.5893	239.6993	267.8447	(64)
Efficiency of water heater												281.1060	(216)
(217)m	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	(217)
Fuel for water heating, kWh/month	96.3785	85.2176	90.4368	79.2237	76.6138	68.8310	67.7545	70.5396	71.4242	79.8949	85.2701	95.2824	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	29.6563	26.7864	29.6563	28.6997	29.6563	28.6997	29.6563	29.6563	28.6997	29.6563	28.6997	29.6563	(231)
Lighting	30.8703	24.7653	22.2984	16.3368	12.6190	10.3098	11.5115	14.9631	19.4355	25.5005	28.8027	31.7283	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	701.9096	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	281.1060	
Water heating fuel used	966.8671	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.1900)		
mechanical ventilation fans (SFP = 1.1900)	349.1794	(230a)
Total electricity for the above, kWh/year	349.1794	(231)
Electricity for lighting (calculated in Appendix L)	249.1413	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2267.0974	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	701.9096	0.1552	108.9520	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	966.8671	0.1410	136.2905	(264)
Space and water heating			245.2426	(265)
Pumps, fans and electric keep-hot	349.1794	0.1387	48.4355	(267)
Energy for lighting	249.1413	0.1443	35.9588	(268)
Total CO2, kg/year			329.6368	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.6200	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	701.9096	1.5746	1105.2587	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	966.8671	1.5212	1470.8230	(278)
Space and water heating			2576.0817	(279)
Pumps, fans and electric keep-hot	349.1794	1.5128	528.2386	(281)
Energy for lighting	249.1413	1.5338	382.1413	(282)
Total Primary energy kWh/year			3486.4616	(286)
Dwelling Primary energy Rate (DPER)			38.3300	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	41.1800	(1b)	x 2.4800	(2b) =	102.1264	(1b) - (3b)
First floor	49.7800	(1c)	x 2.7800	(2c) =	138.3884	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	90.9600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		240.5148	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1247	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3747	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3185	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)

Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4061	0.3982	0.3902	0.3504	0.3424	0.3026	0.3026	0.2946	0.3185	0.3424	0.3583	0.3743 (22b)
Effective ac	0.5825	0.5793	0.5761	0.5614	0.5586	0.5458	0.5458	0.5434	0.5507	0.5586	0.5642	0.5700 (25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			4.1400	1.0000	4.1400			(26)
TER Opening Type			8.5100	1.1450	9.7443			(27)
GF			41.1800	0.1300	5.3534			(28a)
Exposed Floor			8.6000	0.1300	1.1180			(28b)
Main	64.8536	12.6500	52.2036	0.1800	9.3966			(29a)
PIJ	49.7800		49.7800	0.1100	5.4758			(30)
Total net area of external elements Aum(A, m2)			164.4136					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	35.2281			(33)
Main dwelling								
Party Wall 1			88.2100	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	87.1013	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	8.6300	0.0500	0.4315
E3 Sill	8.6300	0.0500	0.4315
E4 Jamb	28.2000	0.0500	1.4100
E5 Ground floor (normal)	13.8200	0.1600	2.2112
E16 Corner (normal)	4.9600	0.0900	0.4464
E12 Gable (insulation at ceiling level)	11.0000	0.0600	0.6600
E6 Intermediate floor within a dwelling	11.0000	0.0000	0.0000
E17 Corner (inverted - internal area greater than external area)	4.9600	-0.0900	-0.4464
P1 Party wall - Ground floor	15.2800	0.0800	1.2224
E20 Exposed floor (normal)	6.4400	0.3200	2.0608
E21 Exposed floor (inverted)	12.0800	0.3200	3.8656
E18 Party wall between dwellings	21.0400	0.0600	1.2624
P4 Party wall - Roof (insulation at ceiling level)	18.1000	0.1200	2.1720

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		15.7274	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	50.9555	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	46.2302	45.9760	45.7269	44.5568	44.3378	43.3187	43.3187	43.1299	43.7112	44.3378	44.7807	45.2438	(38)
Heat transfer coeff	97.1857	96.9316	96.6824	95.5123	95.2934	94.2742	94.2742	94.0855	94.6668	95.2934	95.7363	96.1993	(39)
Average = Sum(39)m / 12 =												95.5112	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0684	1.0657	1.0629	1.0500	1.0476	1.0364	1.0364	1.0344	1.0408	1.0476	1.0525	1.0576	(40)
HLP (average)												1.0500	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy											2.6386	(42)
Hot water usage for mixer showers	68.4610	67.4321	65.9329	63.0644	60.9476	58.5869	57.2450	58.7329	60.3639	62.8986	65.8287	68.1987 (42a)
Hot water usage for baths	29.5637	29.1246	28.5063	27.3663	26.5127	25.5661	25.0549	25.6688	26.3373	27.3502	28.5137	29.4637 (42b)
Hot water usage for other uses	41.6522	40.1376	38.6230	37.1084	35.5937	34.0791	34.0791	35.5937	37.1084	38.6230	40.1376	41.6522 (42c)
Average daily hot water use (litres/day)												128.3946 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	139.6769	136.6944	133.0622	127.5391	123.0540	118.2321	116.3790	119.9955	123.8096	128.8717	134.4799	139.3147	(44)
Energy conte	221.2141	194.6510	204.5117	174.5947	165.6543	145.3802	140.7503	148.5795	152.6696	174.8777	191.5913	218.1331	(45)
Energy content (annual)										Total = Sum(45)m =		2132.6075	
Distribution loss (46)m = 0.15 x (45)m	33.1821	29.1976	30.6768	26.1892	24.8482	21.8070	21.1126	22.2869	22.9004	26.2317	28.7387	32.7200	(46)
Water storage loss:													
Store volume												210.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7016	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.9188	(55)
Total storage loss	28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842	(56)
If cylinder contains dedicated solar storage	28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	272.9607	241.3898	256.2583	224.6720	217.4009	195.4575	192.4969	200.3261	202.7469	226.6243	241.6687	269.8797	(62)
WWHRS	-31.2975	-27.6798	-28.9847	-24.0004	-22.3675	-19.1401	-17.9408	-19.0782	-19.8031	-23.3456	-26.4477	-30.7179	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	241.6632	213.7101	227.2737	200.6716	195.0334	176.3175	174.5562	181.2479	182.9439	203.2787	215.2209	239.1618	(64)
										Total per year (kWh/year) = Sum(64)m =		2451.0786	(64)
12Total per year (kWh/year)												2451	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	114.9510	102.1125	109.3974	98.1146	96.4773	88.4008	88.1968	90.7999	90.8245	99.5441	103.7660	113.9265	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

(66)m	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	142.2156	157.4530	142.2156	146.9561	142.2156	146.9561	142.2156	142.2156	146.9561	142.2156	146.9561	142.2156	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	240.8328	243.3319	237.0343	223.6274	206.7036	190.7976	180.1714	177.6723	183.9699	197.3768	214.3007	230.2066	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	(71)
Water heating gains (Table 5)													
	154.5040	151.9532	147.0395	136.2703	129.6738	122.7789	118.5440	122.0429	126.1452	133.7959	144.1194	153.1270	(72)
Total internal gains													
	603.1319	618.3176	591.8689	572.4333	544.1725	523.1121	503.5105	504.5103	519.6507	538.9678	570.9557	591.1288	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	4.9800	19.6403	0.6300	0.7000	0.7700	29.8916	(76)
West	3.5300	19.6403	0.6300	0.7000	0.7700	21.1882	(80)

Solar gains	51.0797	99.9228	164.5586	239.9990	294.1277	301.0921	286.6519	246.2298	191.3885	118.5668	63.6904	42.0055	(83)
Total gains	654.2116	718.2404	756.4276	812.4323	838.3003	824.2042	790.1625	750.7401	711.0392	657.5346	634.6461	633.1343	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	22.6449	22.7043	22.7628	23.0416	23.0946	23.3442	23.3442	23.3911	23.2474	23.0946	22.9877	22.8771	
alpha	2.5097	2.5136	2.5175	2.5361	2.5396	2.5563	2.5563	2.5594	2.5498	2.5396	2.5325	2.5251	
util living area													
	0.9363	0.9179	0.8900	0.8294	0.7371	0.6002	0.4715	0.5071	0.6872	0.8450	0.9135	0.9408	(86)
MIT	18.4665	18.7376	19.1692	19.7832	20.3219	20.7241	20.8928	20.8676	20.5829	19.8994	19.1053	18.4305	(87)
Th 2	20.0267	20.0290	20.0312	20.0418	20.0438	20.0531	20.0531	20.0548	20.0495	20.0438	20.0398	20.0356	(88)
util rest of house													
	0.9284	0.9077	0.8757	0.8060	0.6983	0.5374	0.3858	0.4222	0.6306	0.8190	0.9010	0.9333	(89)
MIT 2	17.0633	17.4054	17.9489	18.7154	19.3635	19.8213	19.9856	19.9670	19.6760	18.8716	17.8806	17.0230	(90)
Living area fraction										fLA = Living area / (4) =		0.3196	(91)
MIT	17.5118	17.8312	18.3389	19.0566	19.6698	20.1098	20.2755	20.2548	19.9659	19.2001	18.2720	17.4728	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.5118	17.8312	18.3389	19.0566	19.6698	20.1098	20.2755	20.2548	19.9659	19.2001	18.2720	17.4728	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9004	0.8773	0.8442	0.7775	0.6812	0.5414	0.4069	0.4412	0.6251	0.7913	0.8712	0.9063	(94)
Useful gains	589.0216	630.1383	638.5494	631.6864	571.0784	446.2550	321.5222	331.1952	444.4610	520.3070	552.8988	573.8331	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1283.9967	1253.4418	1144.6149	970.0843	759.4665	519.4329	346.5070	362.6828	555.3014	819.5308	1069.5680	1276.8325	(97)
Space heating kWh													
	517.0614	418.8600	376.5127	243.6465	140.1607	0.0000	0.0000	0.0000	0.0000	222.6225	372.0018	523.0315	(98a)
Space heating requirement - total per year (kWh/year)												2813.8972	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	517.0614	418.8600	376.5127	243.6465	140.1607	0.0000	0.0000	0.0000	0.0000	222.6225	372.0018	523.0315	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2813.8972	
Space heating per m2											(98c) / (4) =	30.9355	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	517.0614	418.8600	376.5127	243.6465	140.1607	0.0000	0.0000	0.0000	0.0000	222.6225	372.0018	523.0315	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	560.1966	453.8028	407.9227	263.9724	151.8534	0.0000	0.0000	0.0000	0.0000	241.1945	403.0355	566.6647	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	241.6632	213.7101	227.2737	200.6716	195.0334	176.3175	174.5562	181.2479	182.9439	203.2787	215.2209	239.1618	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.7207	85.5407	85.1837	84.4960	83.3316	79.8000	79.8000	79.8000	79.8000	84.2641	85.2751	85.7649	(217)
Fuel for water heating, kWh/month													
	281.9193	249.8345	266.8041	237.4923	234.0450	220.9492	218.7421	227.1276	229.2530	241.2400	252.3842	278.8574	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)

Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	29.5496	23.7058	21.3444	15.6378	12.0791	9.8687	11.0190	14.3229	18.6040	24.4095	27.5704	30.3709	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-38.9812	-55.1702	-79.5760	-89.7571	-96.9883	-90.5718	-89.4598	-84.3870	-75.4216	-63.2498	-42.9366	-33.6769	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-21.3144	-44.9402	-89.5251	-134.7575	-178.4789	-179.4591	-177.3409	-150.0006	-109.7478	-64.3537	-28.4842	-16.8460	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	3048.6426	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2938.6486	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	238.4821	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-2035.4247	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	4276.3487	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3048.6426	0.2100	640.2150	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2938.6486	0.2100	617.1162	(264)
Space and water heating			1257.3312	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	238.4821	0.1443	34.4203	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-840.1762	0.1345	-113.0202	
PV Unit electricity exported	-1195.2485	0.1258	-150.3985	
Total			-263.4187	(269)
Total CO2, kg/year			1040.2621	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.4400	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	3048.6426	1.1300	3444.9662	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2938.6486	1.1300	3320.6730	(278)
Space and water heating			6765.6391	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	238.4821	1.5338	365.7919	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-840.1762	1.4972	-1257.8767	
PV Unit electricity exported	-1195.2485	0.4619	-552.0620	
Total			-1809.9387	(283)
Total Primary energy kWh/year			5451.5931	(286)
Target Primary Energy Rate (TPER)			59.9300	(287)

Full SAP Calculation Printout

Property Reference	78449-12	**Issued on Date**	03/10/2025
Assessment Reference	001	**Prop Type Ref**	Mid
Property	832 Rochdale Road, MANCHESTER, M9 8FA		

SAP Rating	84 B	**DER**	3.62	**TER**	11.44
Environmental	97 A	**% DER < TER**			68.36
CO_2 Emissions (t/year)	0.32	**DFEE**	34.10	**TFEE**	36.90
Compliance Check	See BREL	**% DFEE < TFEE**			7.58
% DPER < TPER	36.04	**DPER**	38.33	**TPER**	59.93

Assessor Details	Mr. Daniel Goddard	**Assessor ID**	CP52-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	41.1800 (1b)	x	2.4800 (2b)	=	102.1264	(1b) - (3b)
First floor	49.7800 (1c)	x	2.7800 (2c)	=	138.3884	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	90.9600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	240.5148	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.2500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2125	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2709	0.2656	0.2603	0.2338	0.2284	0.2019	0.2019	0.1966	0.2125	0.2284	0.2391	0.2497	(22b)

Balanced mechanical ventilation with heat recovery		
If mechanical ventilation		(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	81.0000	(23c)

Effective ac	0.3659	0.3606	0.3553	0.3287	0.3234	0.2969	0.2969	0.2916	0.3075	0.3234	0.3341	0.3447	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door			4.1400	1.0000	4.1400			(26)
Window			8.5100	0.7752	6.5969			(27)
GF			41.1800	0.0800	3.2944	75.0000	3088.5000	(28a)
Exposed Floor			8.6000	0.1400	1.2040	20.0000	172.0000	(28b)
Main	64.8536	12.6500	52.2036	0.1300	6.7865	9.0000	469.8324	(29a)
PIJ	49.7800		49.7800	0.1300	6.4714	9.0000	448.0200	(30)
Total net area of external elements Aum(A, m2)			164.4136					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		28.4932			(33)
Main dwelling								
Party Wall 1			88.2100	0.0000	0.0000	20.0000	1764.2000	(32)
Timber			96.4800			9.0000	868.3200	(32c)
FF			41.1800			18.0000	741.2400	(32d)
GF			41.1800			9.0000	370.6200	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 7922.7324 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 87.1013 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	8.6300	0.1150	0.9925
E3 Sill	8.6300	0.0170	0.1467
E4 Jamb	28.2000	0.0940	2.6508
E5 Ground floor (normal)	13.8200	0.0670	0.9259
E16 Corner (normal)	4.9600	0.0680	0.3373
E12 Gable (insulation at ceiling level)	11.0000	0.0770	0.8470
E6 Intermediate floor within a dwelling	11.0000	0.0320	0.3520
E17 Corner (inverted - internal area greater than external area)	4.9600	-0.0290	-0.1438
P1 Party wall - Ground floor	15.2800	0.3200	4.8896
E20 Exposed floor (normal)	6.4400	0.0790	0.5088
E21 Exposed floor (inverted)	12.0800	0.0630	0.7610
E18 Party wall between dwellings	21.0400	0.0920	1.9357
P4 Party wall - Roof (insulation at ceiling level)	18.1000	0.1020	1.8462

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 16.0496 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 44.5428 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	29.0444	28.6228	28.2011	26.0928	25.6712	23.5629	23.5629	23.1413	24.4062	25.6712	26.5145	27.3578	(38)
Heat transfer coeff	73.5872	73.1656	72.7439	70.6356	70.2140	68.1057	68.1057	67.6841	68.9490	70.2140	71.0573	71.9006	(39)
Average = Sum(39)m / 12 =												70.5302	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8090	0.8044	0.7997	0.7766	0.7719	0.7487	0.7487	0.7441	0.7580	0.7719	0.7812	0.7905	(40)
HLP (average)												0.7754	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6386 (42)
Hot water usage for mixer showers

68.4610	67.4321	65.9329	63.0644	60.9476	58.5869	57.2450	58.7329	60.3639	62.8986	65.8287	68.1987	(42a)

Hot water usage for baths

29.5637	29.1246	28.5063	27.3663	26.5127	25.5661	25.0549	25.6688	26.3373	27.3502	28.5137	29.4637	(42b)

Hot water usage for other uses

41.6522	40.1376	38.6230	37.1084	35.5937	34.0791	34.0791	35.5937	37.1084	38.6230	40.1376	41.6522	(42c)

Average daily hot water use (litres/day) 128.3946 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	139.6769	136.6944	133.0622	127.5391	123.0540	118.2321	116.3790	119.9955	123.8096	128.8717	134.4799	139.3147	(44)
Energy conte	221.2141	194.6510	204.5117	174.5947	165.6543	145.3802	140.7503	148.5795	152.6696	174.8777	191.5913	218.1331	(45)
Energy content (annual)										Total = Sum(45)m =		2132.6075	

Distribution loss (46)m = 0.15 x (45)m

33.1821	29.1976	30.6768	26.1892	24.8482	21.8070	21.1126	22.2869	22.9004	26.2317	28.7387	32.7200	(46)

Water storage loss:
Store volume 210.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.5800 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.8532 (55)
Total storage loss

26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(56)

If cylinder contains dedicated solar storage

26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(57)
23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Primary loss
Combi loss
Total heat required for water heating calculated for each month

270.9257	239.5518	254.2233	222.7027	215.3659	193.4882	190.4619	198.2911	200.7776	224.5893	239.6993	267.8447	(62)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

WWHRS
PV diverter
Solar input
FGHRS
Output from w/h

270.9257	239.5518	254.2233	222.7027	215.3659	193.4882	190.4619	198.2911	200.7776	224.5893	239.6993	267.8447	(64)
									Total per year (kWh/year) = Sum(64)m =		2717.9215	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)

Heat gains from water heating, kWh/month

113.3230	100.6421	107.7694	96.5391	94.8493	86.8253	86.5688	89.1720	89.2490	97.9161	102.1905	112.2985	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	35.2685	31.3252	25.4754	19.2865	14.4169	12.1713	13.1516	17.0949	22.9447	29.1336	34.0032	36.2488	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	359.4520	363.1820	353.7825	333.7722	308.5128	284.7725	268.9125	265.1825	274.5820	294.5923	319.8517	343.5920	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	(71)
Water heating gains (Table 5)	152.3158	149.7650	144.8514	134.0821	127.4857	120.5907	116.3559	119.8548	123.9570	131.6077	141.9313	150.9389	(72)
Total internal gains	653.2794	650.5153	630.3524	593.3839	556.6585	523.7777	504.6631	508.3753	527.7268	561.5767	602.0293	637.0228	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W

East				4.9800		19.6403		0.3000		0.0000		0.7700		22.5938 (76)
West				3.5300		19.6403		0.3000		0.0000		0.7700		16.0153 (80)
Solar gains	38.6090	75.5274	124.3829	181.4051	222.3188	227.5828	216.6681	186.1147	144.6625	89.6197	48.1409	31.7502	(83)
Total gains	691.8885	726.0427	754.7353	774.7891	778.9772	751.3605	721.3312	694.4900	672.3893	651.1964	650.1702	668.7729	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	29.9068	30.0792	30.2535	31.1565	31.3436	32.3139	32.3139	32.5152	31.9186	31.3436	30.9716	30.6084	
alpha	2.9938	3.0053	3.0169	3.0771	3.0896	3.1543	3.1543	3.1677	3.1279	3.0896	3.0648	3.0406	
util living area	0.9130	0.8953	0.8598	0.7904	0.6853	0.5313	0.3998	0.4281	0.6153	0.7969	0.8839	0.9186	(86)
Living	19.3352	19.5255	19.8642	20.3151	20.6625	20.8951	20.9678	20.9598	20.8232	20.4014	19.8348	19.3320	
Non living	18.7181	18.9066	19.2387	19.6852	20.0091	20.2266	20.2808	20.2797	20.1633	19.7757	19.2264	18.7270	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.1483	19.5255	19.8642	20.3151	20.6625	20.8951	20.9678	20.9598	20.8232	20.4014	19.8348	19.5653	(87)
Th 2	20.2455	20.2495	20.2536	20.2737	20.2777	20.2980	20.2980	20.3020	20.2899	20.2777	20.2697	20.2616	(88)
util rest of house	0.9039	0.8846	0.8451	0.7682	0.6514	0.4833	0.3408	0.3691	0.5687	0.7713	0.8706	0.9102	(89)
MIT 2	19.4642	18.9066	19.2387	19.6852	20.0091	20.2266	20.2808	20.2797	20.1633	19.7757	19.2264	18.9416	(90)
Living area fraction										fLA = Living area / (4) =		0.3196	(91)
MIT	19.6828	19.1044	19.4386	19.8865	20.2180	20.4402	20.5003	20.4970	20.3742	19.9756	19.4208	19.1409	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6828	19.1044	19.4386	19.8865	20.2180	20.4402	20.5003	20.4970	20.3742	19.9756	19.4208	19.1409	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8965	0.8654	0.8269	0.7553	0.6485	0.4933	0.3581	0.3859	0.5745	0.7596	0.8526	0.8952	(94)
Useful gains	620.2474	628.3480	624.1182	585.2252	505.1566	370.6474	258.3365	268.0102	386.2635	494.6223	554.3581	598.7034	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1131.9783	1039.2719	941.2033	776.0376	598.0796	397.7520	265.6354	277.3043	432.5995	658.3016	875.4841	1074.2629	(97)
Space heating kWh	380.7278	276.1409	235.9113	137.3849	69.1347	0.0000	0.0000	0.0000	0.0000	121.7775	231.2107	353.8162	(98a)
Space heating requirement - total per year (kWh/year)												1806.1040	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	380.7278	276.1409	235.9113	137.3849	69.1347	0.0000	0.0000	0.0000	0.0000	121.7775	231.2107	353.8162	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1806.1040	
Space heating per m2											(98c) / (4) =	19.8560	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												270.7081	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	380.7278	276.1409	235.9113	137.3849	69.1347	0.0000	0.0000	0.0000	0.0000	121.7775	231.2107	353.8162	(98)
Space heating efficiency (main heating system 1)	270.7081	270.7081	270.7081	270.7081	270.7081	0.0000	0.0000	0.0000	0.0000	270.7081	270.7081	270.7081	(210)
Space heating fuel (main heating system)	140.6414	102.0069	87.1460	50.7502	25.5385	0.0000	0.0000	0.0000	0.0000	44.9848	85.4096	130.7003	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	270.9257	239.5518	254.2233	222.7027	215.3659	193.4882	190.4619	198.2911	200.7776	224.5893	239.6993	267.8447	(64)
Efficiency of water heater												281.1060	(216)
(217)m	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	(217)
Fuel for water heating, kWh/month	96.3785	85.2176	90.4368	79.2237	76.6138	68.8310	67.7545	70.5396	71.4242	79.8949	85.2701	95.2824	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	29.6563	26.7864	29.6563	28.6997	29.6563	28.6997	29.6563	29.6563	28.6997	29.6563	28.6997	29.6563	(231)
Lighting	30.8703	24.7653	22.2984	16.3368	12.6190	10.3098	11.5115	14.9631	19.4355	25.5005	28.8027	31.7283	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													

Space heating fuel - main system 1	667.1777	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	281.1060	
Water heating fuel used	966.8671	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.1900)		
mechanical ventilation fans (SFP = 1.1900)	349.1794	(230a)
Total electricity for the above, kWh/year	349.1794	(231)
Electricity for lighting (calculated in Appendix L)	249.1413	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2232.3655	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	667.1777	16.4900	110.0176	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	966.8671	16.4900	159.4364	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	349.1794	16.4900	57.5797	(249)
Energy for lighting	249.1413	16.4900	41.0834	(250)
Additional standing charges			0.0000	(251)
Total energy cost			368.1171	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.9747	(257)
SAP value		84.1999	
SAP rating (Section 12)		84	(258)
SAP band		B	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	667.1777	0.1552	103.5263	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	966.8671	0.1410	136.2905	(264)
Space and water heating			239.8168	(265)
Pumps, fans and electric keep-hot	349.1794	0.1387	48.4355	(267)
Energy for lighting	249.1413	0.1443	35.9588	(268)
Total CO2, kg/year			324.2111	(272)
CO2 emissions per m2			3.5600	(273)
EI value			96.8046	
EI rating			97	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	41.1800 (1b)	x	2.4800 (2b)	=	102.1264	(1b) - (3b)
First floor	49.7800 (1c)	x	2.7800 (2c)	=	138.3884	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 90.9600						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		240.5148	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.2500 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2125 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.6000	4.5000	4.5000	4.1000	4.2000	3.7000	3.5000	3.5000	3.7000	4.1000	4.1000	4.2000	(22)
Wind factor	1.1500	1.1250	1.1250	1.0250	1.0500	0.9250	0.8750	0.8750	0.9250	1.0250	1.0250	1.0500	(22a)
Adj infilt rate	0.2444	0.2391	0.2391	0.2178	0.2231	0.1966	0.1859	0.1859	0.1966	0.2178	0.2178	0.2231	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	81.0000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.3394	0.3341	0.3341	0.3128	0.3181	0.2916	0.2809	0.2809	0.2916	0.3128	0.3128	0.3181	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door			4.1400	1.0000	4.1400			(26)
Window			8.5100	0.7752	6.5969			(27)
GF			41.1800	0.0800	3.2944	75.0000	3088.5000	(28a)
Exposed Floor			8.6000	0.1400	1.2040	20.0000	172.0000	(28b)
Main	64.8536	12.6500	52.2036	0.1300	6.7865	9.0000	469.8324	(29a)
PIJ	49.7800		49.7800	0.1300	6.4714	9.0000	448.0200	(30)
Total net area of external elements Aum(A, m2)			164.4136					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	28.4932			(33)
Main dwelling								
Party Wall 1			88.2100	0.0000	0.0000	20.0000	1764.2000	(32)
Timber			96.4800			9.0000	868.3200	(32c)
FF			41.1800			18.0000	741.2400	(32d)
GF			41.1800			9.0000	370.6200	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) =	7922.7324 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	87.1013 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	8.6300	0.1150	0.9925
E3 Sill	8.6300	0.0170	0.1467
E4 Jamb	28.2000	0.0940	2.6508
E5 Ground floor (normal)	13.8200	0.0670	0.9259
E16 Corner (normal)	4.9600	0.0680	0.3373
E12 Gable (insulation at ceiling level)	11.0000	0.0770	0.8470
E6 Intermediate floor within a dwelling	11.0000	0.0320	0.3520
E17 Corner (inverted - internal area greater than external area)	4.9600	-0.0290	-0.1438
P1 Party wall - Ground floor	15.2800	0.3200	4.8896
E20 Exposed floor (normal)	6.4400	0.0790	0.5088
E21 Exposed floor (inverted)	12.0800	0.0630	0.7610
E18 Party wall between dwellings	21.0400	0.0920	1.9357
P4 Party wall - Roof (insulation at ceiling level)	18.1000	0.1020	1.8462

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		16.0496 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	44.5428 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	26.9362	26.5145	26.5145	24.8279	25.2495	23.1413	22.2980	22.2980	23.1413	24.8279	24.8279	25.2495	(38)
Heat transfer coeff	71.4789	71.0573	71.0573	69.3707	69.7923	67.6841	66.8408	66.8408	67.6841	69.3707	69.3707	69.7923	(39)
Average = Sum(39)m / 12 =												69.1950	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7858	0.7812	0.7812	0.7627	0.7673	0.7441	0.7348	0.7348	0.7441	0.7627	0.7627	0.7673	(40)
HLP (average)												0.7607	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.6386 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	68.4610	67.4321	65.9329	63.0644	60.9476	58.5869	57.2450	58.7329	60.3639	62.8986	65.8287	68.1987	(42a)
Hot water usage for baths	29.5637	29.1246	28.5063	27.3663	26.5127	25.5661	25.0549	25.6688	26.3373	27.3502	28.5137	29.4637	(42b)
Hot water usage for other uses	41.6522	40.1376	38.6230	37.1084	35.5937	34.0791	34.0791	35.5937	37.1084	38.6230	40.1376	41.6522	(42c)
Average daily hot water use (litres/day)												128.3946	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	139.6769	136.6944	133.0622	127.5391	123.0540	118.2321	116.3790	119.9955	123.8096	128.8717	134.4799	139.3147	(44)
Energy conte	221.2141	194.6510	204.5117	174.5947	165.6543	145.3802	140.7503	148.5795	152.6696	174.8777	191.5913	218.1331	(45)
Energy content (annual)										Total = Sum(45)m =		2132.6075	
Distribution loss (46)m = 0.15 x (45)m	33.1821	29.1976	30.6768	26.1892	24.8482	21.8070	21.1126	22.2869	22.9004	26.2317	28.7387	32.7200	(46)

Water storage loss:	
Store volume	210.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):	1.5800 (48)
Temperature factor from Table 2b	0.5400 (49)
Enter (49) or (54) in (55)	0.8532 (55)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Total storage loss	26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(56)
If cylinder contains dedicated solar storage	26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

	270.9257	239.5518	254.2233	222.7027	215.3659	193.4882	190.4619	198.2911	200.7776	224.5893	239.6993	267.8447	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	270.9257	239.5518	254.2233	222.7027	215.3659	193.4882	190.4619	198.2911	200.7776	224.5893	239.6993	267.8447	(64)
											Total per year (kWh/year) = Sum(64)m =	2717.9215	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
											Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	0.0000	(64a)
Heat gains from water heating, kWh/month													
	113.3230	100.6421	107.7694	96.5391	94.8493	86.8253	86.5688	89.1720	89.2490	97.9161	102.1905	112.2985	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	35.2685	31.3252	25.4754	19.2865	14.4169	12.1713	13.1516	17.0949	22.9447	29.1336	34.0032	36.2488	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	359.4520	363.1820	353.7825	333.7722	308.5128	284.7725	268.9125	265.1825	274.5820	294.5923	319.8517	343.5920	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	(71)
Water heating gains (Table 5)													
	152.3158	149.7650	144.8514	134.0821	127.4857	120.5907	116.3559	119.8548	123.9570	131.6077	141.9313	150.9389	(72)
Total internal gains													
	653.2794	650.5153	630.3524	593.3839	556.6585	523.7777	504.6631	508.3753	527.7268	561.5767	602.0293	637.0228	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	4.9800	16.6187	0.3000	0.0000	0.7700	19.1178	(76)
West	3.5300	16.6187	0.3000	0.0000	0.7700	13.5514	(80)

Solar gains	32.6692	67.1355	116.6090	172.9395	207.2659	216.2037	201.7650	170.7039	137.1149	82.8303	42.3057	28.7264	(83)
Total gains	685.9486	717.6508	746.9614	766.3235	763.9244	739.9813	706.4281	679.0793	664.8417	644.4070	644.3350	665.7491	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	30.7889	30.9716	30.9716	31.7246	31.5330	32.5152	32.9254	32.9254	32.5152	31.7246	31.7246	31.5330	
alpha	3.0526	3.0648	3.0648	3.1150	3.1022	3.1677	3.1950	3.1950	3.1677	3.1150	3.1150	3.1022	
util living area													
	0.9076	0.8893	0.8555	0.7783	0.6637	0.5085	0.4012	0.4240	0.6138	0.7911	0.8761	0.9127	(86)
Living	19.4724	19.6531	19.9361	20.3878	20.7157	20.9144	20.9692	20.9630	20.8310	20.4375	19.9418	19.4757	
Non living	18.8674	19.0462	19.3204	19.7636	20.0604	20.2457	20.2936	20.2899	20.1808	19.8160	19.3425	18.8828	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.2185	19.6531	19.9361	20.3878	20.7157	20.9144	20.9692	20.9630	20.8310	20.4375	19.9418	19.6889	(87)
Th 2	20.2656	20.2697	20.2697	20.2858	20.2818	20.3020	20.3102	20.3102	20.3020	20.2858	20.2858	20.2818	(88)
util rest of house													
	0.8980	0.8780	0.8404	0.7549	0.6271	0.4584	0.3429	0.3646	0.5678	0.7648	0.8618	0.9037	(89)
MIT 2	19.5503	19.0462	19.3204	19.7636	20.0604	20.2457	20.2936	20.2899	20.1808	19.8160	19.3425	19.0785	(90)
Living area fraction										fLA = Living area / (4) =		0.3196	(91)
MIT	19.7639	19.2402	19.5172	19.9631	20.2698	20.4594	20.5095	20.5050	20.3886	20.0147	19.5340	19.2736	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7639	19.2402	19.5172	19.9631	20.2698	20.4594	20.5095	20.5050	20.3886	20.0147	19.5340	19.2736	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8908	0.8595	0.8230	0.7434	0.6265	0.4700	0.3600	0.3818	0.5738	0.7539	0.8447	0.8890	(94)
Useful gains	611.0418	616.8058	614.7283	569.7172	478.5917	347.8123	254.3424	259.2418	381.4628	485.8323	544.2386	591.8804	(95)
Ext temp.	4.7000	5.3000	6.7000	9.3000	12.3000	15.0000	16.6000	16.5000	14.1000	10.8000	7.5000	4.6000	(96)
Heat loss rate W													
	1076.7501	990.5516	910.7546	739.7053	556.2338	369.5173	261.3146	267.6971	425.6384	639.2266	834.8081	1024.1033	(97)
Space heating kWh													
	346.4870	251.1572	220.2435	122.3914	57.7657	0.0000	0.0000	0.0000	0.0000	114.1253	209.2101	321.5739	(98a)
Space heating requirement - total per year (kWh/year)												1642.9541	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	346.4870	251.1572	220.2435	122.3914	57.7657	0.0000	0.0000	0.0000	0.0000	114.1253	209.2101	321.5739	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1642.9541	
Space heating per m2											(98c) / (4) =	18.0624	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)

Efficiency of main space heating system 1 (in %)												269.7489	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	346.4870	251.1572	220.2435	122.3914	57.7657	0.0000	0.0000	0.0000	0.0000	114.1253	209.2101	321.5739	(98)
Space heating efficiency (main heating system 1)													
	269.7489	269.7489	269.7489	269.7489	269.7489	0.0000	0.0000	0.0000	0.0000	269.7489	269.7489	269.7489	(210)
Space heating fuel (main heating system)													
	128.4480	93.1078	81.6476	45.3723	21.4146	0.0000	0.0000	0.0000	0.0000	42.3080	77.5573	119.2123	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	270.9257	239.5518	254.2233	222.7027	215.3659	193.4882	190.4619	198.2911	200.7776	224.5893	239.6993	267.8447	(64)
Efficiency of water heater												281.4160	(216)
(217)m	281.4160	281.4160	281.4160	281.4160	281.4160	281.4160	281.4160	281.4160	281.4160	281.4160	281.4160	281.4160	(217)
Fuel for water heating, kWh/month													
	96.2723	85.1237	90.3372	79.1365	76.5294	68.7552	67.6798	70.4619	71.3455	79.8069	85.1761	95.1775	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	29.6563	26.7864	29.6563	28.6997	29.6563	28.6997	29.6563	29.6563	28.6997	29.6563	28.6997	29.6563	(231)
Lighting	30.8703	24.7653	22.2984	16.3368	12.6190	10.3098	11.5115	14.9631	19.4355	25.5005	28.8027	31.7283	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												609.0679	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												281.4160	
Water heating fuel used												965.8020	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.1900)													
mechanical ventilation fans (SFP = 1.1900)												349.1794	(230a)
Total electricity for the above, kWh/year												349.1794	(231)
Electricity for lighting (calculated in Appendix L)												249.1413	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												2173.1906	(238)

10a. Fuel costs - using BEDF prices (583)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	609.0679	28.4300	173.1580	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	965.8020	28.4300	274.5775	(247)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(247a)
Pumps, fans and electric keep-hot	349.1794	28.4300	99.2717	(249)
Energy for lighting	249.1413	28.4300	70.8309	(250)
Additional standing charges			0.0000	(251)
Total energy cost			617.8381	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	609.0679	0.1552	94.5380	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	965.8020	0.1410	136.1404	(264)
Space and water heating			230.6784	(265)
Pumps, fans and electric keep-hot	349.1794	0.1387	48.4355	(267)
Energy for lighting	249.1413	0.1443	35.9588	(268)
Total CO2, kg/year			315.0726	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	609.0679	1.5746	959.0631	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	965.8020	1.5212	1469.2027	(278)
Space and water heating			2428.2658	(279)

Pumps, fans and electric keep-hot	349.1794	1.5128	528.2386 (281)
Energy for lighting	249.1413	1.5338	382.1413 (282)
Total Primary energy kWh/year			3338.6457 (286)

SAP 10 EPC IMPROVEMENTS

001

Current energy efficiency rating: B 84
Current environmental impact rating: A 97

N Solar water heating		Recommended
U Solar photovoltaic panels		Recommended
V2 Wind turbine		Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
N Solar water heating	+ 1.4	-£ 53	-23 kg (7.2%)
U Solar photovoltaic panels	+ 8.2	-£ 277	-207 kg (70.8%)

	Typical annual savings		Energy efficiency	Environmental impact
Recommended measures				
Solar water heating	£53	0.25 kg/m²	B 86	A 97
Solar photovoltaic panels	£277	2.27 kg/m²	A 94	A 99
Total Savings	£330	2.52 kg/m²		

Potential energy efficiency rating: A 94
Potential environmental impact rating: A 99

Fuel prices for cost data on this page from database revision number 583 TEST (01 Oct 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, West Pennines (England)):

	Current	Potential	Saving
Electricity	£618	£565	£53
Space heating	£272	£298	-£26
Water heating	£275	£196	£78
Lighting	£71	£71	£0
Generated (PV)	-£0	-£277	£277
Total cost of fuels	£618	£288	£330
Total cost of uses	£618	£288	£329
Delivered energy	24 kWh/m²	4 kWh/m²	20 kWh/m²
Carbon dioxide emissions	0.3 tonnes	0.1 tonnes	0.2 tonnes
CO2 emissions per m²	3 kg/m²	1 kg/m²	3 kg/m²
Primary energy	37 kWh/m²	16 kWh/m²	20 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	41.1800	(1b)	x 2.4800	(2b) =	102.1264	(1b) - (3b)
First floor	49.7800	(1c)	x 2.7800	(2c) =	138.3884	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	90.9600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		240.5148	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.2500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2125	(21)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													
	0.2709	0.2656	0.2603	0.2338	0.2284	0.2019	0.2019	0.1966	0.2125	0.2284	0.2391	0.2497	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	81.0000	(23c)

Effective ac	0.3659	0.3606	0.3553	0.3287	0.3234	0.2969	0.2969	0.2916	0.3075	0.3234	0.3341	0.3447	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Door			4.1400	1.0000	4.1400			(26)
Window			8.5100	0.7752	6.5969			(27)
GF			41.1800	0.0800	3.2944	75.0000	3088.5000	(28a)
Exposed Floor			8.6000	0.1400	1.2040	20.0000	172.0000	(28b)
Main	64.8536	12.6500	52.2036	0.1300	6.7865	9.0000	469.8324	(29a)
PIJ	49.7800		49.7800	0.1300	6.4714	9.0000	448.0200	(30)
Total net area of external elements Aum(A, m2)			164.4136					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	28.4932			(33)
Main dwelling								
Party Wall 1			88.2100	0.0000	0.0000	20.0000	1764.2000	(32)
Timber			96.4800			9.0000	868.3200	(32c)
FF			41.1800			18.0000	741.2400	(32d)
GF			41.1800			9.0000	370.6200	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 7922.7324	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	87.1013	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	8.6300	0.1150	0.9925
E3 Sill	8.6300	0.0170	0.1467
E4 Jamb	28.2000	0.0940	2.6508
E5 Ground floor (normal)	13.8200	0.0670	0.9259
E16 Corner (normal)	4.9600	0.0680	0.3373
E12 Gable (insulation at ceiling level)	11.0000	0.0770	0.8470
E6 Intermediate floor within a dwelling	11.0000	0.0320	0.3520
E17 Corner (inverted - internal area greater than external area)	4.9600	-0.0290	-0.1438
P1 Party wall - Ground floor	15.2800	0.3200	4.8896
E20 Exposed floor (normal)	6.4400	0.0790	0.5088
E21 Exposed floor (inverted)	12.0800	0.0630	0.7610
E18 Party wall between dwellings	21.0400	0.0920	1.9357
P4 Party wall - Roof (insulation at ceiling level)	18.1000	0.1020	1.8462

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		16.0496 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	44.5428 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	29.0444	28.6228	28.2011	26.0928	25.6712	23.5629	23.5629	23.1413	24.4062	25.6712	26.5145	27.3578	(38)
Heat transfer coeff													
	73.5872	73.1656	72.7439	70.6356	70.2140	68.1057	68.1057	67.6841	68.9490	70.2140	71.0573	71.9006	(39)
Average = Sum(39)m / 12 =												70.5302	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8090	0.8044	0.7997	0.7766	0.7719	0.7487	0.7487	0.7441	0.7580	0.7719	0.7812	0.7905	(40)
HLP (average)												0.7754	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.6386	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
68.4610	67.4321	65.9329	63.0644	60.9476	58.5869	57.2450	58.7329	60.3639	62.8986	65.8287	68.1987	(42a)

Hot water usage for baths

29.5637	29.1246	28.5063	27.3663	26.5127	25.5661	25.0549	25.6688	26.3373	27.3502	28.5137	29.4637	(42b)

Hot water usage for other uses

41.6522	40.1376	38.6230	37.1084	35.5937	34.0791	34.0791	35.5937	37.1084	38.6230	40.1376	41.6522	(42c)

Average daily hot water use (litres/day)	128.3946	(43)

Daily hot water use

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
139.6769	136.6944	133.0622	127.5391	123.0540	118.2321	116.3790	119.9955	123.8096	128.8717	134.4799	139.3147	(44)
Energy conte 221.2141	194.6510	204.5117	174.5947	165.6543	145.3802	140.7503	148.5795	152.6696	174.8777	191.5913	218.1331	(45)

Energy content (annual) Total = Sum(45)m =	2132.6075	
Distribution loss (46)m = 0.15 x (45)m		
33.1821 29.1976 30.6768 26.1892 24.8482 21.8070 21.1126 22.2869 22.9004 26.2317 28.7387 32.7200		(46)
Water storage loss:		
Store volume	210.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):	1.5800	(48)
Temperature factor from Table 2b	0.5400	(49)
Enter (49) or (54) in (55)	0.8532	(55)
Total storage loss		
26.4492 23.8896 26.4492 25.5960 26.4492 25.5960 26.4492 26.4492 25.5960 26.4492 25.5960 26.4492		(56)
If cylinder contains dedicated solar storage		
17.0031 15.3576 17.0031 16.4546 17.0031 16.4546 17.0031 17.0031 16.4546 17.0031 16.4546 17.0031		(57)
Primary loss 23.2624 21.0112 21.8667 15.7584 10.4681 9.9053 10.2355 11.1660 17.1091 21.8667 22.5120 23.2624		(59)
Combi loss 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000		(61)
Total heat required for water heating calculated for each month		
261.4795 231.0198 243.3814 206.8077 193.1255 171.7400 167.9889 176.7485 186.2333 213.7474 230.5579 258.3985		(62)
WWHRS 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000		(63a)
PV diverter -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000		(63b)
Aperture area of solar collector	3.0000	(H1)
Zero-loss collector efficiency	0.8000	(H2)
Collector linear heat loss coefficient	1.8000	(H3)
Collector 2nd order heat loss coefficient	0.0000	(H4)
Collector loop efficiency	0.9000	(H5)
Incidence angle modifier	1.0000	(H6)
Overshading factor	0.8000	(H8)
Overall heat loss coefficient of system	6.5000	(H10)
Heat loss coefficient of collector loop	3.9667	(H11)

Dedicated solar storage volume												75.0000	(H12)
If combined cylinder, total volume of cylinder												210.0000	(H13)
Effective solar volume												115.5000	(H14)
Reference volume												225.0000	(H15)
Storage tank correction coefficient												1.1814	(H16)
Heat delivered to hot water												654.6757	(H24)
Heat delivered to space heating												0.0000	(H29)
Solar input												654.6757	
Solar input	-0.0000	-20.1906	-62.4438	-83.8682	-107.6151	-99.0457	-98.2732	-86.8675	-61.6791	-33.2791	-1.4133	-0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	261.4795	210.8291	180.9377	122.9394	85.5104	72.6943	69.7156	89.8809	124.5542	180.4683	229.1446	258.3985	(64)
									Total per year (kWh/year) = Sum(64)m =			1886.5527	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month													
	105.7660	93.8165	99.0959	83.8231	77.0570	69.4268	68.5903	71.9379	77.6136	89.2426	94.8774	104.7416	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	35.2685	31.3252	25.4754	19.2865	14.4169	12.1713	13.1516	17.0949	22.9447	29.1336	34.0032	36.2488	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	359.4520	363.1820	353.7825	333.7722	308.5128	284.7725	268.9125	265.1825	274.5820	294.5923	319.8517	343.5920	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	(71)
Water heating gains (Table 5)													
	142.1587	139.6079	133.1934	116.4210	103.5712	96.4261	92.1913	96.6907	107.7967	119.9497	131.7741	140.7817	(72)
Total internal gains													
	643.1223	640.3582	618.6944	575.7228	532.7440	499.6131	480.4985	485.2112	511.5665	549.9188	591.8722	626.8656	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	4.9800	19.6403	0.3000	0.0000	0.7700	22.5938	(76)
West	3.5300	19.6403	0.3000	0.0000	0.7700	16.0153	(80)

Solar gains	38.6090	75.5274	124.3829	181.4051	222.3188	227.5828	216.6681	186.1147	144.6625	89.6197	48.1409	31.7502	(83)
Total gains	681.7313	715.8856	743.0774	757.1279	755.0628	727.1959	697.1666	671.3260	656.2290	639.5384	640.0131	658.6158	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	29.9068	30.0792	30.2535	31.1565	31.3436	32.3139	32.3139	32.5152	31.9186	31.3436	30.9716	30.6084	
alpha	2.9938	3.0053	3.0169	3.0771	3.0896	3.1543	3.1543	3.1677	3.1279	3.0896	3.0648	3.0406	
util living area													
	0.9157	0.8984	0.8640	0.7984	0.6982	0.5451	0.4122	0.4410	0.6258	0.8030	0.8876	0.9213	(86)
Living	19.3145	19.5061	19.8448	20.2926	20.6435	20.8871	20.9649	20.9562	20.8144	20.3863	19.8161	19.3108	
Non living	18.6981	18.8880	19.2203	19.6648	19.9931	20.2209	20.2792	20.2776	20.1566	19.7621	19.2087	18.7064	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.1378	19.5061	19.8448	20.2926	20.6435	20.8871	20.9649	20.9562	20.8144	20.3863	19.8161	19.5471	(87)
Th 2	20.2455	20.2495	20.2536	20.2737	20.2777	20.2980	20.2980	20.3020	20.2899	20.2777	20.2697	20.2616	(88)
util rest of house													
	0.9069	0.8878	0.8496	0.7766	0.6646	0.4966	0.3518	0.3807	0.5791	0.7779	0.8746	0.9131	(89)
MIT 2	19.4539	18.8880	19.2203	19.6648	19.9931	20.2209	20.2792	20.2776	20.1566	19.7621	19.2087	18.9240	(90)
Living area fraction										fLA = Living area / (4) =		0.3196	(91)
MIT	19.6725	19.0856	19.4199	19.8655	20.2010	20.4338	20.4983	20.4945	20.3668	19.9616	19.4028	19.1231	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6725	19.0856	19.4199	19.8655	20.2010	20.4338	20.4983	20.4945	20.3668	19.9616	19.4028	19.1231	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8995	0.8687	0.8313	0.7632	0.6608	0.5063	0.3694	0.3977	0.5844	0.7657	0.8566	0.8983	(94)
Useful gains	613.1837	621.9176	617.6904	577.8741	498.9600	368.1690	257.5291	267.0090	383.4943	489.7138	548.2439	591.6221	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1131.2183	1037.8938	939.8427	774.5522	596.8894	397.3137	265.4963	277.1319	432.0910	657.3130	874.2039	1072.9796	(97)
Space heating kWh													
	385.4178	279.5360	239.6813	141.6082	72.8594	0.0000	0.0000	0.0000	0.0000	124.6938	234.6911	358.1300	(98a)
Space heating requirement - total per year (kWh/year)												1836.6177	
Solar heating kWh													
	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	385.4178	279.5360	239.6813	141.6082	72.8594	0.0000	0.0000	0.0000	0.0000	124.6938	234.6911	358.1300	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1836.6177	
Space heating per m2											(98c) / (4) =	20.1915	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												270.7081	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	385.4178	279.5360	239.6813	141.6082	72.8594	0.0000	0.0000	0.0000	0.0000	124.6938	234.6911	358.1300	(98)
Space heating efficiency (main heating system 1)													
	270.7081	270.7081	270.7081	270.7081	270.7081	0.0000	0.0000	0.0000	0.0000	270.7081	270.7081	270.7081	(210)
Space heating fuel (main heating system)													
	142.3739	103.2610	88.5386	52.3103	26.9144	0.0000	0.0000	0.0000	0.0000	46.0621	86.6953	132.2938	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	261.4795	210.8291	180.9377	122.9394	85.5104	72.6943	69.7156	89.8809	124.5542	180.4683	229.1446	258.3985	(64)
Efficiency of water heater												281.1060	(216)
(217)m	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	(217)
Fuel for water heating, kWh/month													
	93.0181	74.9999	64.3663	43.7342	30.4193	25.8601	24.8005	31.9740	44.3086	64.1994	81.5154	91.9221	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	36.4509	32.9233	36.4509	35.2750	36.4509	35.2750	36.4509	36.4509	35.2750	36.4509	35.2750	36.4509	(231)
Lighting	30.8703	24.7653	22.2984	16.3368	12.6190	10.3098	11.5115	14.9631	19.4355	25.5005	28.8027	31.7283	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-37.4126	-55.2815	-82.5768	-94.8457	-102.3112	-93.2996	-92.1870	-86.5589	-76.2048	-63.7088	-41.7331	-31.9441	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-12.6739	-28.2985	-59.7695	-95.9263	-133.3716	-138.4141	-136.4645	-113.2151	-80.2583	-43.1370	-17.6767	-9.9697	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	678.4495	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	281.1060	
Water heating fuel used	671.1179	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.1900)		
mechanical ventilation fans (SFP = 1.1900)	349.1794	(230a)
pump for solar water heating	80.0000	(230g)
Total electricity for the above, kWh/year	429.1794	(231)
Electricity for lighting (calculated in Appendix L)	249.1413	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1727.2394	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	300.6487	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	678.4495	16.4900	111.8763	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	671.1179	16.4900	110.6673	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	349.1794	16.4900	57.5797	(249)
Pump for solar water heating	80.0000	16.4900	13.1920	(249)
Energy for lighting	249.1413	16.4900	41.0834	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-858.0643	16.4900	-141.4948	
PV Unit electricity exported	-869.1751	5.5900	-48.5869	
Total			-190.0817	(252)
Total energy cost			144.3171	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.3821	(257)
SAP value		93.8057	
SAP rating (Section 12)		94	(258)
SAP band		A	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	678.4495	0.1551	105.2275	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	671.1179	0.1462	98.1454	(264)
Space and water heating			203.3729	(265)
Pumps, fans and electric keep-hot	429.1794	0.1387	59.5325	(267)
Energy for lighting	249.1413	0.1443	35.9588	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-858.0643	0.1343	-115.2389	
PV Unit electricity exported	-869.1751	0.1239	-107.6905	
Total			-222.9293	(269)
Total CO2, kg/year			75.9348	(272)
CO2 emissions per m2			0.8300	(273)
EI value			99.2516	
EI rating			99	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	41.1800	(1b) x	2.4800	(2b) =	102.1264	(1b) - (3b)
First floor	49.7800	(1c) x	2.7800	(2c) =	138.3884	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	90.9600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		240.5148	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.2500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2125	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.6000	4.5000	4.5000	4.1000	4.2000	3.7000	3.5000	3.5000	3.7000	4.1000	4.1000	4.2000	(22)
Wind factor	1.1500	1.1250	1.1250	1.0250	1.0500	0.9250	0.8750	0.8750	0.9250	1.0250	1.0250	1.0500	(22a)
Adj infilt rate	0.2444	0.2391	0.2391	0.2178	0.2231	0.1966	0.1859	0.1859	0.1966	0.2178	0.2178	0.2231	(22b)
Balanced mechanical ventilation with heat recovery													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												81.0000	(23c)
Effective ac	0.3394	0.3341	0.3341	0.3128	0.3181	0.2916	0.2809	0.2809	0.2916	0.3128	0.3128	0.3181	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door			4.1400	1.0000	4.1400			(26)
Window			8.5100	0.7752	6.5969			(27)
GF			41.1800	0.0800	3.2944	75.0000	3088.5000	(28a)
Exposed Floor			8.6000	0.1400	1.2040	20.0000	172.0000	(28b)
Main	64.8536	12.6500	52.2036	0.1300	6.7865	9.0000	469.8324	(29a)
PIJ	49.7800		49.7800	0.1300	6.4714	9.0000	448.0200	(30)
Total net area of external elements Aum(A, m2)			164.4136					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		28.4932			(33)
Main dwelling								
Party Wall 1			88.2100	0.0000	0.0000	20.0000	1764.2000	(32)
Timber			96.4800			9.0000	868.3200	(32c)
FF			41.1800			18.0000	741.2400	(32d)
GF			41.1800			9.0000	370.6200	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		7922.7324	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							87.1013	(35)
List of Thermal Bridges								
K1 Element				Length	Psi-value	Total		

E2 Other lintels (including other steel lintels)	8.6300	0.1150	0.9925	
E3 Sill	8.6300	0.0170	0.1467	
E4 Jamb	28.2000	0.0940	2.6508	
E5 Ground floor (normal)	13.8200	0.0670	0.9259	
E16 Corner (normal)	4.9600	0.0680	0.3373	
E12 Gable (insulation at ceiling level)	11.0000	0.0770	0.8470	
E6 Intermediate floor within a dwelling	11.0000	0.0320	0.3520	
E17 Corner (inverted - internal area greater than external area)	4.9600	-0.0290	-0.1438	
P1 Party wall - Ground floor	15.2800	0.3200	4.8896	
E20 Exposed floor (normal)	6.4400	0.0790	0.5088	
E21 Exposed floor (inverted)	12.0800	0.0630	0.7610	
E18 Party wall between dwellings	21.0400	0.0920	1.9357	
P4 Party wall - Roof (insulation at ceiling level)	18.1000	0.1020	1.8462	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 16.0496 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 44.5428 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	26.9362	26.5145	26.5145	24.8279	25.2495	23.1413	22.2980	22.2980	23.1413	24.8279	24.8279	25.2495	(38)
Heat transfer coeff	71.4789	71.0573	71.0573	69.3707	69.7923	67.6841	66.8408	66.8408	67.6841	69.3707	69.3707	69.7923	(39)

Average = Sum(39)m / 12 = 69.1950

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7858	0.7812	0.7812	0.7627	0.7673	0.7441	0.7348	0.7348	0.7441	0.7627	0.7627	0.7673	(40)
HLP (average)												0.7607	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6386 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
68.4610	67.4321	65.9329	63.0644	60.9476	58.5869	57.2450	58.7329	60.3639	62.8986	65.8287	68.1987	(42a)

Hot water usage for baths

29.5637	29.1246	28.5063	27.3663	26.5127	25.5661	25.0549	25.6688	26.3373	27.3502	28.5137	29.4637	(42b)

Hot water usage for other uses

41.6522	40.1376	38.6230	37.1084	35.5937	34.0791	34.0791	35.5937	37.1084	38.6230	40.1376	41.6522	(42c)

Average daily hot water use (litres/day) 128.3946 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	139.6769	136.6944	133.0622	127.5391	123.0540	118.2321	116.3790	119.9955	123.8096	128.8717	134.4799	139.3147	(44)
Energy conte	221.2141	194.6510	204.5117	174.5947	165.6543	145.3802	140.7503	148.5795	152.6696	174.8777	191.5913	218.1331	(45)
Energy content (annual)										Total = Sum(45)m =		2132.6075	
Distribution loss (46)m = 0.15 x (45)m	33.1821	29.1976	30.6768	26.1892	24.8482	21.8070	21.1126	22.2869	22.9004	26.2317	28.7387	32.7200	(46)

Water storage loss:
Store volume 210.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.5800 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.8532 (55)
Total storage loss

26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(56)

If cylinder contains dedicated solar storage

17.0031	15.3576	17.0031	16.4546	17.0031	16.4546	17.0031	17.0031	16.4546	17.0031	16.4546	17.0031	(57)
Primary loss 23.2624	21.0112	21.8667	15.7584	10.4681	9.9053	10.2355	11.1660	17.1091	21.8667	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

261.4795	231.0198	243.3814	206.8077	193.1255	171.7400	167.9889	176.7485	186.2333	213.7474	230.5579	258.3985	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)

Aperture area of solar collector 3.0000 (H1)
Zero-loss collector efficiency 0.8000 (H2)
Collector linear heat loss coefficient 1.8000 (H3)
Collector 2nd order heat loss coefficient 0.0000 (H4)
Collector loop efficiency 0.9000 (H5)
Incidence angle modifier 1.0000 (H6)
Overshading factor 0.8000 (H8)
Overall heat loss coefficient of system 6.5000 (H10)
Heat loss coefficient of collector loop 3.9667 (H11)
Dedicated solar storage volume 75.0000 (H12)
If combined cylinder, total volume of cylinder 210.0000 (H13)
Effective solar volume 115.5000 (H14)
Reference volume 225.0000 (H15)
Storage tank correction coefficient 1.1814 (H16)
Heat delivered to hot water 599.1897 (H24)
Heat delivered to space heating 0.0000 (H29)
Solar input 599.1897

Solar input -0.0000	-14.4822	-56.8249	-79.3403	-100.2904	-94.0949	-90.8995	-78.3168	-56.9604	-27.9802	-0.0000	-0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

261.4795	216.5376	186.5565	127.4673	92.8350	77.6451	77.0894	98.4317	129.2728	185.7672	230.5579	258.3985	(64)
							Total per year (kWh/year) = Sum(64)m =				1942.0387	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
							Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =				0.0000	(64a)

Heat gains from water heating, kWh/month

105.7660	93.8165	99.0959	83.8231	77.0570	69.4268	68.5903	71.9379	77.6136	89.2426	94.8774	104.7416	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	35.2685	31.3252	25.4754	19.2865	14.4169	12.1713	13.1516	17.0949	22.9447	29.1336	34.0032	36.2488	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	359.4520	363.1820	353.7825	333.7722	308.5128	284.7725	268.9125	265.1825	274.5820	294.5923	319.8517	343.5920	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)	
Losses e.g. evaporation (negative values) (Table 5)	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	(71)
Water heating gains (Table 5)													

	142.1587	139.6079	133.1934	116.4210	103.5712	96.4261	92.1913	96.6907	107.7967	119.9497	131.7741	140.7817	(72)
Total internal gains	643.1223	640.3582	618.6944	575.7228	532.7440	499.6131	480.4985	485.2112	511.5665	549.9188	591.8722	626.8656	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	4.9800	16.6187	0.3000	0.0000	0.7700	19.1178	(76)
West	3.5300	16.6187	0.3000	0.0000	0.7700	13.5514	(80)

Solar gains	32.6692	67.1355	116.6090	172.9395	207.2659	216.2037	201.7650	170.7039	137.1149	82.8303	42.3057	28.7264	(83)
Total gains	675.7915	707.4937	735.3035	748.6623	740.0099	715.8167	682.2635	655.9152	648.6814	632.7491	634.1778	655.5920	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	30.7889	30.9716	30.9716	31.7246	31.5330	32.5152	32.9254	32.9254	32.5152	31.7246	31.7246	31.5330	
alpha	3.0526	3.0648	3.0648	3.1150	3.1022	3.1677	3.1950	3.1950	3.1677	3.1150	3.1150	3.1022	
util living area	0.9105	0.8925	0.8598	0.7866	0.6771	0.5223	0.4139	0.4372	0.6245	0.7975	0.8800	0.9156	(86)
Living	19.4520	19.6341	19.9169	20.3665	20.6987	20.9076	20.9663	20.9596	20.8224	20.4227	19.9237	19.4549	
Non living	18.8477	19.0280	19.3024	19.7444	20.0463	20.2410	20.2920	20.2879	20.1742	19.8028	19.3253	18.8626	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.2081	19.6341	19.9169	20.3665	20.6987	20.9076	20.9663	20.9596	20.8224	20.4227	19.9237	19.6710	(87)
Th 2	20.2656	20.2697	20.2697	20.2858	20.2818	20.3020	20.3102	20.3102	20.3020	20.2858	20.2858	20.2818	(88)
util rest of house	0.9012	0.8814	0.8451	0.7637	0.6407	0.4716	0.3542	0.3765	0.5784	0.7716	0.8661	0.9068	(89)
MIT 2	19.5403	19.0280	19.3024	19.7444	20.0463	20.2410	20.2920	20.2879	20.1742	19.8028	19.3253	19.0611	(90)
Living area fraction										fLA = Living area / (4) =		0.3196	(91)
MIT	19.7537	19.2217	19.4988	19.9432	20.2548	20.4541	20.5075	20.5026	20.3813	20.0009	19.5165	19.2560	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7537	19.2217	19.4988	19.9432	20.2548	20.4541	20.5075	20.5026	20.3813	20.0009	19.5165	19.2560	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8940	0.8630	0.8275	0.7517	0.6393	0.4830	0.3716	0.3938	0.5839	0.7603	0.8489	0.8923	(94)
Useful gains	604.1499	610.5443	608.4308	562.7679	473.0604	345.7264	253.5441	258.2962	378.7460	481.0579	538.3296	584.9821	(95)
Ext temp.	4.7000	5.3000	6.7000	9.3000	12.3000	15.0000	16.6000	16.5000	14.1000	10.8000	7.5000	4.6000	(96)
Heat loss rate W	1076.0231	989.2387	909.4455	738.3266	555.1862	369.1525	261.1787	267.5356	425.1462	638.2757	833.5944	1022.8793	(97)
Space heating kWh	351.0737	254.4826	223.9550	126.4022	61.1016	0.0000	0.0000	0.0000	0.0000	116.9700	212.5906	325.7955	(98a)
Space heating requirement - total per year (kWh/year)												1672.3713	
Solar heating kWh	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	351.0737	254.4826	223.9550	126.4022	61.1016	0.0000	0.0000	0.0000	0.0000	116.9700	212.5906	325.7955	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1672.3713	
Space heating per m2											(98c) / (4) =	18.3858	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												269.7489	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	351.0737	254.4826	223.9550	126.4022	61.1016	0.0000	0.0000	0.0000	0.0000	116.9700	212.5906	325.7955	(98)
Space heating efficiency (main heating system 1)	269.7489	269.7489	269.7489	269.7489	269.7489	0.0000	0.0000	0.0000	0.0000	269.7489	269.7489	269.7489	(210)
Space heating fuel (main heating system)	130.1483	94.3406	83.0235	46.8592	22.6513	0.0000	0.0000	0.0000	0.0000	43.3626	78.8106	120.7773	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	261.4795	216.5376	186.5565	127.4673	92.8350	77.6451	77.0894	98.4317	129.2728	185.7672	230.5579	258.3985	(64)
Efficiency of water heater												281.4160	(216)
(217)m	281.4160	281.4160	281.4160	281.4160	281.4160	281.4160	281.4160	281.4160	281.4160	281.4160	281.4160	281.4160	(217)
Fuel for water heating, kWh/month	92.9156	76.9457	66.2921	45.2950	32.9885	27.5909	27.3934	34.9773	45.9366	66.0116	81.9278	91.8208	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	36.4509	32.9233	36.4509	35.2750	36.4509	35.2750	36.4509	36.4509	35.2750	36.4509	35.2750	36.4509	(231)
Lighting	30.8703	24.7653	22.2984	16.3368	12.6190	10.3098	11.5115	14.9631	19.4355	25.5005	28.8027	31.7283	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-32.3272	-50.1980	-78.6403	-91.6477	-98.0326	-90.9865	-89.0327	-82.6495	-73.7822	-60.0630	-37.4118	-29.2154	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)

Electricity generated by PVs (Appendix M) (negative quantity)

(233b)m	-10.0537	-24.0953	-54.8093	-90.2216	-121.6925	-129.1415	-123.8914	-100.5827	-74.5176	-38.6885	-14.7968	-8.7066	(233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	619.9733	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	281.4160	
Water heating fuel used	690.0953	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.1900)		
mechanical ventilation fans (SFP = 1.1900)	349.1794	(230a)
pump for solar water heating	80.0000	(230g)
Total electricity for the above, kWh/year	429.1794	(231)
Electricity for lighting (calculated in Appendix L)	249.1413	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1605.1846	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	383.2047	(238)

10a. Fuel costs - using BEDF prices (583)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	619.9733	28.4300	176.2584	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	690.0953	28.4300	196.1941	(247)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(247a)
Pumps, fans and electric keep-hot	349.1794	28.4300	99.2717	(249)
Pump for solar water heating	80.0000	28.4300	22.7440	(249)
Energy for lighting	249.1413	28.4300	70.8309	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-813.9870	28.4300	-231.4165	
PV Unit electricity exported	-791.1976	5.8100	-45.9686	
Total			-277.3851	(252)
Total energy cost			287.9140	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	619.9733	0.1551	96.1865	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	690.0953	0.1458	100.6197	(264)
Space and water heating			196.8062	(265)
Pumps, fans and electric keep-hot	429.1794	0.1387	59.5325	(267)
Energy for lighting	249.1413	0.1443	35.9588	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-813.9870	0.1339	-109.0180	
PV Unit electricity exported	-791.1976	0.1237	-97.8355	
Total			-206.8535	(269)
Total CO2, kg/year			85.4440	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	619.9733	1.5744	976.0710	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	690.0953	1.5394	1062.3003	(278)
Space and water heating			2038.3713	(279)
Pumps, fans and electric keep-hot	429.1794	1.5128	649.2626	(281)
Energy for lighting	249.1413	1.5338	382.1413	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-813.9870	1.4950	-1216.8829	
PV Unit electricity exported	-791.1976	0.4538	-359.0721	
Total			-1575.9549	(283)
Total Primary energy kWh/year			1493.8202	(286)

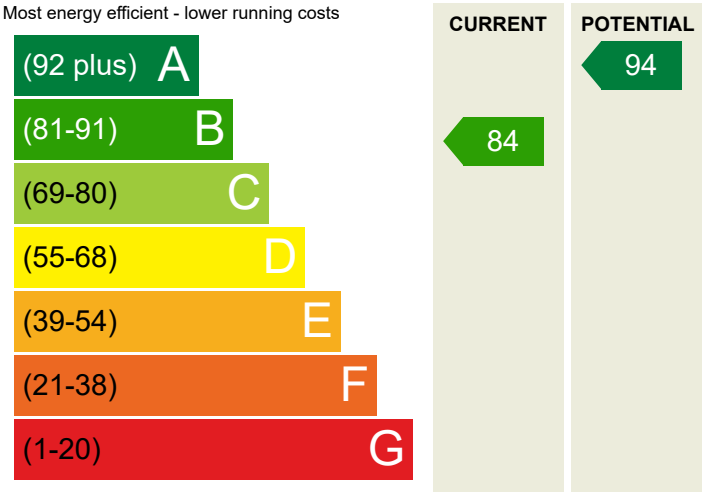
Energy Report

Dwelling Address	832 Rochdale Road, MANCHESTER, M9 8FA
Reference	78449-12-001
Assessment Date	02/07/2025
Submission Date	
Property Type	House, Mid-Terrace
Total Floor Area	91

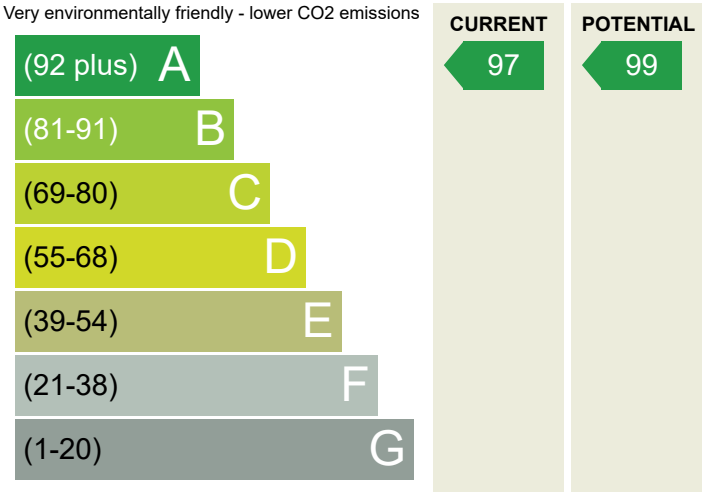
This Energy Report has been generated using the UK's National Calculation Methodology for dwellings, Standard Assessment Procedure (SAP). This methodology is used to assess the energy efficiency of dwellings which is calculated based on a dwelling's heating, hot water, ventilation and lighting usage.

This document is not an Energy Performance Certificate (EPC) as required by the Energy Performance of Buildings Regulations

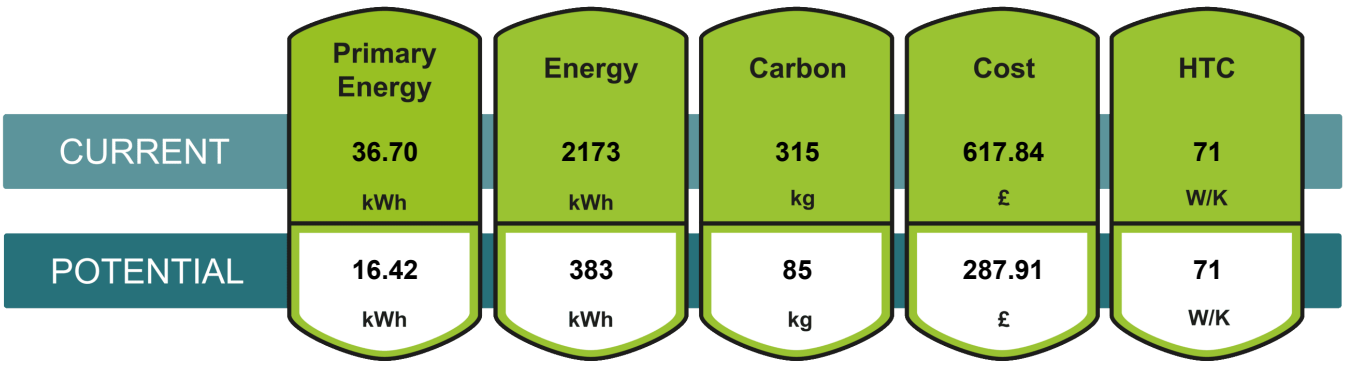
Energy Efficiency Rating



Carbon Dioxide (CO2) Emissions Rating



Additional ratings for your home



Energy Report

Breakdown of property's energy performance

Each feature is assessed as one of the following:

Very Poor | Poor | Average | Good | Very Good

Feature	Description	Energy Performance
Walls	Average thermal transmittance 0.13 W/m²K	Very Good
Roof	Average thermal transmittance 0.13 W/m²K	Very Good
Floor	Average thermal transmittance 0.09 W/m²K	Very Good
Windows	High performance glazing	Very Good
Main heating	Air source heat pump, radiators, electric	Good
Main heating controls	Programmer, room thermostat and TRVs	Good
Secondary heating	None	
Hot water	From main system	Good
Lighting	Good lighting efficiency	Good
Air tightness	Air permeability [AP50] = 5.0 m³/h.m² (as tested)	Good

Recommendations

The recommended measures provided below will help to improve the energy efficiency of the dwelling.
To reach the dwelling's potential energy rating all of the recommended measures shown below would need to be installed.
Having these measures installed individually or in any other order may give a different result when compared with the cumulative potential rating.

Recommended measures	Cumulative savings (per year)	Cumulative rating	Typical costs	Incremental savings (per year)	Cumulative CO2 rating
Solar water heating	£53	B 86	£4,000 - £7,000	£53	A 97
Photovoltaic	£330	A 94	£8,000 - £10,000	£277	A 99

Energy Report

The typical cost is based on average installation prices across the country so may not be representative of the actual costs in your area.

Estimated energy costs of the dwelling

The table below shows the estimated running costs of the space and water heating and lighting within the dwelling. It does not include the energy used from household appliances. The estimated annual costs after potential improvements indicates the total energy cost if all recommended measures named above were installed.

	Estimated annual costs	Estimated annual costs after potential improvements	Potential future savings
Lighting	£71	£71	
Heating	£272	£298	
Hot Water	£275	£196	
New Technologies e.g. Impact of PV	£0	-(£277)	
TOTAL	£618	£288	

Estimated energy use and potential savings

Space Heating
609
kWh per year

Water Heating
966
kWh per year

Energy Report

About this document

Created by:	
Company/Trading name:	
Phone number:	
Email address:	

Disclaimer

This Energy Report should not under any circumstances be treated as a Condition Survey and cannot be used to indicate that any element of the dwelling (e.g.heating system) is working correctly.
This Energy Report must not be used in situations where an Energy Performance Certificate (EPC) is required.
This Energy Report is generated from a set of data inputs which may not reflect the actual dimensions, services or construction of the dwelling.
The calculation used to generate this report reflects the SAP Methodology current at the time of report generation.

Glossary terms for additional metrics

Primary Energy	The measure of the energy required for lighting, heating and hot water in a property. This includes the efficiency of the property's heating system, power station efficiency for electricity and the energy used to produce the fuel and deliver it to the property.
Energy Used	The estimated amount of fuel energy for lighting, heating and hot water for the property. The estimate is based on typical usage which is likely to be different to actual consumption.
Carbon (CO2)	The current emissions based on the energy estimates.
Cost	The estimated cost of energy. The cost of each unit of fuel is based on an industry standard which is likely to be different to those the occupier actually pays.
Heat Transfer Coefficient	Heat flow through the property envelope where internal and external temperatures are different.

Building Regulations England Part L (BREL) Compliance Report

Approved Document L1 2021 Edition, England assessed by Array SAP 10 program, Array

Date: Fri 03 Oct 2025 15:03:28

Project Information			
Assessed By	Paul Goddard	Building Type	House, End-terrace
OCDEA Registration	EES/005113	Assessment Date	2025-10-03

Dwelling Details			
Assessment Type	As built	Total Floor Area	120 m^2
Site Reference	78449-13	Plot Reference	001
Address	830 Rochdale Road, MANCHESTER, M9 8FA		

Client Details	
Name	-
Company	John Southworth
Address	Unit 10, Charles Street, DUKINFIELD, SK16 4SD

This report covers items included within the SAP calculations. It is not a complete report of regulations compliance.

1a Target emission rate and dwelling emission rate		
Fuel for main heating system	Electricity	
Target carbon dioxide emission rate	*10.67 $kgCO_2/m^2$*	
Dwelling carbon dioxide emission rate	3.34 $kgCO_2/m^2$	OK
1b Target primary energy rate and dwelling primary energy		
Target primary energy	*55.97 kWh_{PE}/m^2*	
Dwelling primary energy	35.29 kWh_{PE}/m^2	OK
1c Target fabric energy efficiency and dwelling fabric energy efficiency		
Target fabric energy efficiency	*37.9 kWh/m^2*	
Dwelling fabric energy efficiency	33.4 kWh/m^2	OK

2a Fabric U-values				
Element	***Maximum permitted average U-Value [W/m^2K]***	**Dwelling average U-Value [W/m^2K]**	**Element with highest individual U-Value**	
External walls	*0.26*	0.12	Walls (1) (0.13)	OK
Party walls	*0.2*	0	Party Wall (1) (0)	**N/A**
Curtain walls	*1.6*	0	N/A	**N/A**
Floors	*0.18*	0.09	Exposed Floor (0.14)	OK
Roofs	*0.16*	0.11	Roof (1) (0.13)	OK
Windows, doors, and roof windows	*1.6*	0.86	Front (1)	OK
Rooflights	*2.2*	N/A	N/A	**N/A**

2b Envelope elements (better than typically expected values are flagged with a subsequent (!))		
Name	**Net area [m^2]**	**U-Value [W/m^2K]**
Exposed wall: Walls (1)	115.58	0.13 **(!)**
Exposed wall: Walls (2)	16.77	0.09 **(!)**
Party wall: Party Wall (1)	47.6	0 **(!)**
Ground floor: GF, GF	47.06	0.09 **(!)**
Upper floor: Exposed Floor, Exposed Floor	2.72	0.14
Exposed roof: Roof (1)	15.51	0.13
Exposed roof: Roof (2)	17.54	0.13
Exposed roof: Roof (3)	26.38	0.09 **(!)**

2c Openings (better than typically expected values are flagged with a subsequent (!))				
Name	**Area [m^2]**	**Orientation**	**Frame factor**	**U-Value [W/m^2K]**
Front, Door	1.99	East	N/A	1 **(!)**
Front, Window	5.8	East	1.0	0.8 **(!)**
Rear, Window	2.81	West	1.0	0.8 **(!)**
Rear, Door	2.15	West	N/A	1 **(!)**
Side, Window	0.78	South	1.0	0.8 **(!)**

2d Thermal bridging (better than typically expected values are flagged with a subsequent (!))
Building part **1**: Thermal bridging calculated from linear thermal transmittances for each junction

Main element	Junction detail	Source	Psi value [W/mK]	Drawing / reference
External wall	E2: Other lintels (including other steel lintels)	Calculated by person with suitable expertise	0.115	Thermal Bridge Report
External wall	E3: Sill	Calculated by person with suitable expertise	0.017 **(!)**	Thermal Bridge Report
External wall	E4: Jamb	Calculated by person with suitable expertise	0.094	Thermal Bridge Report
External wall	E5: Ground floor (normal)	Calculated by person with suitable expertise	0.067	Thermal Bridge Report
External wall	E11: Eaves (insulation at rafter level)	Calculated by person with suitable expertise	0.025 **(!)**	Thermal Bridge Report
External wall	E16: Corner (normal)	Calculated by person with suitable expertise	0.068	Thermal Bridge Report
External wall	E12: Gable (insulation at ceiling level)	Calculated by person with suitable expertise	0.077	Thermal Bridge Report
External wall	E6: Intermediate floor within a dwelling	Calculated by person with suitable expertise	0.032 **(!)**	Thermal Bridge Report
External wall	E17: Corner (inverted - internal area greater than external area)	Calculated by person with suitable expertise	-0.029 **(!)**	Thermal Bridge Report
Party wall	P1: Ground floor	SAP table default	0.32	K1
External wall	E20: Exposed floor (normal)	Calculated by person with suitable expertise	0.079	Thermal Bridge Report
External wall	E21: Exposed floor (inverted)	Calculated by person with suitable expertise	0.063	Thermal Bridge Report
External wall	E13: Gable (insulation at rafter level)	Calculated by person with suitable expertise	0.074	Thermal Bridge Report
External wall	E18: Party wall between dwellings	Calculated by person with suitable expertise	0.092	Thermal Bridge Report
Roof	R6: Flat ceiling	Calculated by person with suitable expertise	-0.043	Thermal Bridge Report

3 Air permeability (better than typically expected values are flagged with a subsequent (!))		
Maximum permitted air permeability at 50Pa	*8 m^3/hm^2*	
Dwelling air permeability at 50Pa	5 m^3/hm^2, Measured value	OK
Air permeability test certificate reference		

4 Space heating	
Main heating system 1: Heat pump with radiators or underfloor heating - Electricity	
Efficiency	280.8%
Emitter type	Radiators
Flow temperature	45°C
System type	
Manufacturer	Daikin Europe NV
Model	EDLA09DA3V3
Commissioning	
Secondary heating system: N/A	
Fuel	N/A
Efficiency	N/A
Commissioning	

5 Hot water	
Cylinder/store - type: Cylinder	
Capacity	210 litres
Declared heat loss	1.58 kWh/day
Primary pipework insulated	Yes
Manufacturer	
Model	
Commissioning	
Waste water heat recovery system 1 - type: N/A	
Efficiency	
Manufacturer	
Model	

6 Controls		
Main heating 1 - type: Programmer, room thermostat and TRVs		
Function		
Ecodesign class		
Manufacturer		
Model		
Water heating - type: Cylinder thermostat and HW separately timed		
Manufacturer		
Model		

7 Lighting		
Minimum permitted light source efficacy	*75 lm/W*	
Lowest light source efficacy	80 lm/W	OK
External lights control	N/A	

8 Mechanical ventilation		
System type: Balanced whole-house mechanical ventilation with heat recovery		
Maximum permitted specific fan power	*1.5 W/(l/s)*	
Specific fan power	0.97 W/(l/s)	OK
Minimum permitted heat recovery efficiency	*73%*	
Heat recovery efficiency	89%	OK
Manufacturer/Model	DV110 Adroit	
Commissioning		

9 Local generation
N/A

10 Heat networks
N/A

11 Supporting documentary evidence	
Documentary evidence identified in 11.1 and 11.2 is needed to confirm the data values used for any calculations undertaken, manufacturer declarations made, and tests performed as reflected in this "As built" BREL Compliance Report are correct. 11.1 SAP Conventions, Appendix 1 (documentary evidence) schedules the minimum documentary evidence required. 11.2 Indicative photographic evidence of key stages during construction (guidance within Approved Document L, Volume 1 – Appendix B) that confirms the products identified in this BREL Compliance Report are used in this dwelling, and workmanship is of sufficient quality to support the calculated values claimed in 2a to 2d.	

12 Declarations	
a. Assessor Declaration	
This declaration by the assessor is confirmation that the contents of this BREL Compliance Report are a true and accurate reflection based upon the design and construction information submitted for this dwelling for the purpose of carrying out the assessment, and that the supporting documentary evidence (identified in 11.1 and 11.2) pursuant to Part L of the Building Regulations 2010 (as amended) has been reviewed in the course of preparing this BREL Compliance Report.	
Signed: Name:	Assessor ID: Date:
b. Client Declaration	
This declaration by the client is confirmation that the dwelling has been constructed and completed according to the specifications set out in this BREL Compliance Report, and that photographic evidence of key stages, as described in 11.2, has been provided to the Assessor for this dwelling.	
Signed: Name:	Organisation: Date:

Full SAP Calculation Printout

Property Reference	78449-13	**Issued on Date**	03/10/2025
Assessment Reference	001	**Prop Type Ref**	End
Property	830 Rochdale Road, MANCHESTER, M9 8FA		

SAP Rating	84 B	**DER**	3.34	**TER**	10.67
Environmental	97 A	**% DER < TER**			68.70
CO_2 Emissions (t/year)	0.38	**DFEE**	33.38	**TFEE**	37.89
Compliance Check	See BREL	**% DFEE < TFEE**			11.92
% DPER < TPER	36.95	**DPER**	35.29	**TPER**	55.97

Assessor Details	Mr. Daniel Goddard	**Assessor ID**	CP52-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.0600 (1b)	x	2.4800 (2b)	=	116.7088	(1b) - (3b)
First floor	49.7800 (1c)	x	2.7800 (2c)	=	138.3884	(1c) - (3c)
Second floor	23.4000 (1d)	x	2.7700 (2d)	=	64.8180	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	120.2400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	319.9152	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.2500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2125	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2709	0.2656	0.2603	0.2338	0.2284	0.2019	0.2019	0.1966	0.2125	0.2284	0.2391	0.2497	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	80.1000 (23c)

Effective ac	0.3704	0.3651	0.3598	0.3332	0.3279	0.3014	0.3014	0.2961	0.3120	0.3279	0.3386	0.3492	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door			4.1400	1.0000	4.1400			(26)
Window			9.3900	0.7752	7.2791			(27)
GF			47.0600	0.0900	4.2354	75.0000	3529.5000	(28a)
Exposed Floor			2.7200	0.1400	0.3808	20.0000	54.4000	(28b)
Main	129.1100	13.5300	115.5800	0.1300	15.0254	9.0000	1040.2200	(29a)
Dwarf Wall (PIRx0.72)	16.7700		16.7700	0.0900	1.5093	9.0000	150.9300	(29a)
PIJ	15.5100		15.5100	0.1300	2.0163	9.0000	139.5900	(30)
PIR	17.5400		17.5400	0.1300	2.2802	9.0000	157.8600	(30)
Residual Ceiling	26.3800		26.3800	0.0900	2.3742	9.0000	237.4200	(30)
Total net area of external elements Aum(A, m2)			255.0900					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		39.2407			(33)
Main dwelling								
Party Wall 1			47.6000	0.0000	0.0000	20.0000	952.0000	(32)

Timber	124.1700		9.0000	1117.5300 (32c)
FF	47.0600		18.0000	847.0800 (32d)
SF	23.4000		18.0000	421.2000 (32d)
GF	47.0600		9.0000	423.5400 (32e)
FF	23.4000		9.0000	210.6000 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 9281.8700 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 77.1945 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	9.3200	0.1150	1.0718
E3 Sill	9.3200	0.0170	0.1584
E4 Jamb	30.6000	0.0940	2.8764
E5 Ground floor (normal)	20.0500	0.0670	1.3434
E11 Eaves (insulation at rafter level)	18.1000	0.0250	0.4525
E16 Corner (normal)	24.0800	0.0680	1.6374
E12 Gable (insulation at ceiling level)	5.6600	0.0770	0.4358
E6 Intermediate floor within a dwelling	39.5500	0.0320	1.2656
E17 Corner (inverted - internal area greater than external area)	2.4800	-0.0290	-0.0719
P1 Party wall - Ground floor	9.0500	0.3200	2.8960
E20 Exposed floor (normal)	3.3800	0.0790	0.2670
E21 Exposed floor (inverted)	3.3800	0.0630	0.2129
E13 Gable (insulation at rafter level)	8.2800	0.0740	0.6127
E18 Party wall between dwellings	10.5200	0.0920	0.9678
R6 Flat ceiling	18.1000	-0.0430	-0.7783

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 13.3476 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 52.5883 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	39.1078	38.5470	37.9861	35.1819	34.6210	31.8168	31.8168	31.2559	32.9385	34.6210	35.7427	36.8644	(38)
Heat transfer coeff	91.6962	91.1353	90.5745	87.7702	87.2093	84.4051	84.4051	83.8442	85.5268	87.2093	88.3310	89.4527	(39)
Average = Sum(39)m / 12 =												87.6300	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7626	0.7579	0.7533	0.7300	0.7253	0.7020	0.7020	0.6973	0.7113	0.7253	0.7346	0.7440	(40)
HLP (average)												0.7288	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.8642 (42)
Hot water usage for mixer showers

72.2437	71.1580	69.5759	66.5490	64.3151	61.8240	60.4080	61.9781	63.6992	66.3739	69.4659	71.9669	(42a)

Hot water usage for baths

31.1904	30.7271	30.0748	28.8721	27.9715	26.9729	26.4334	27.0812	27.7865	28.8550	30.0826	31.0849	(42b)

Hot water usage for other uses

43.9627	42.3640	40.7654	39.1667	37.5681	35.9694	35.9694	37.5681	39.1667	40.7654	42.3640	43.9627	(42c)

Average daily hot water use (litres/day) 135.4907 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	147.3967	144.2491	140.4161	134.5878	129.8547	124.7663	122.8109	126.6274	130.6524	135.9943	141.9125	147.0144	(44)
Energy conte	233.4403	205.4088	215.8143	184.2439	174.8094	153.4147	148.5292	156.7911	161.1075	184.5430	202.1803	230.1891	(45)
Energy content (annual)										Total = Sum(45)m =		2250.4717	
Distribution loss (46)m = 0.15 x (45)m	35.0160	30.8113	32.3722	27.6366	26.2214	23.0122	22.2794	23.5187	24.1661	27.6815	30.3271	34.5284	(46)
Water storage loss:													
Store volume												210.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5800	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8532	(55)
Total storage loss	26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(56)
If cylinder contains dedicated solar storage	26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	283.1519	250.3096	265.5259	232.3519	224.5210	201.5227	198.2408	206.5027	209.2155	234.2546	250.2883	279.9007	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	283.1519	250.3096	265.5259	232.3519	224.5210	201.5227	198.2408	206.5027	209.2155	234.2546	250.2883	279.9007	(64)
										Total per year (kWh/year) = Sum(64)m =		2835.7857	(64)
12Total per year (kWh/year)												2836	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	117.3882	104.2191	111.5276	99.7475	97.8934	89.4968	89.1552	91.9023	92.0546	101.1298	105.7114	116.3071	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	178.7463	197.8977	178.7463	184.7045	178.7463	184.7045	178.7463	178.7463	184.7045	178.7463	184.7045	178.7463	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	285.5253	288.4881	281.0218	265.1269	245.0625	226.2048	213.6066	210.6438	218.1101	234.0050	254.0694	272.9272	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	(71)
Water heating gains (Table 5)	157.7798	155.0879	149.9026	138.5382	131.5771	124.3011	119.8323	123.5246	127.8537	135.9272	146.8213	156.3268	(72)
Total internal gains	688.0149	707.4373	675.6343	654.3332	621.3495	601.1739	578.1487	578.8782	596.6318	614.6420	651.5588	673.9638	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	5.8000	19.6403	0.3000	0.0000	0.7700	26.3140	(76)
South	0.7800	46.7521	0.3000	0.0000	0.7700	8.4238	(78)
West	2.8100	19.6403	0.3000	0.0000	0.7700	12.7487	(80)

Solar gains	47.4865	90.2110	143.4182	203.3988	245.6287	250.1756	238.6758	207.2016	164.7202	105.5531	58.6917	39.4022	(83)
Total gains	735.5014	797.6482	819.0525	857.7320	866.9782	851.3495	816.8245	786.0799	761.3520	720.1951	710.2505	713.3660	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	28.1178	28.2909	28.4661	29.3755	29.5645	30.5467	30.5467	30.7510	30.1461	29.5645	29.1890	28.8230	
alpha	2.8745	2.8861	2.8977	2.9584	2.9710	3.0364	3.0364	3.0501	3.0097	2.9710	2.9459	2.9215	
util living area	0.9330	0.9133	0.8861	0.8209	0.7227	0.5652	0.4310	0.4605	0.6486	0.8269	0.9050	0.9370	(86)
Living	19.0328	19.2765	19.6262	20.1537	20.5628	20.8585	20.9537	20.9430	20.7701	20.2620	19.6198	19.0405	
Non living	18.4596	18.7015	19.0475	19.5724	19.9602	20.2385	20.3127	20.3094	20.1595	19.6847	19.0563	18.4788	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	19.9936	19.2765	19.6262	20.1537	20.5628	20.8585	20.9537	20.9430	20.7701	20.2620	19.6198	19.3146	(87)
Th 2	20.2859	20.2899	20.2940	20.3144	20.3185	20.3391	20.3391	20.3432	20.3309	20.3185	20.3103	20.3022	(88)
util rest of house	0.9263	0.9048	0.8745	0.8022	0.6925	0.5197	0.3729	0.4027	0.6056	0.8055	0.8945	0.9308	(89)
MIT 2	19.3516	18.7015	19.0475	19.5724	19.9602	20.2385	20.3127	20.3094	20.1595	19.6847	19.0563	18.7339	(90)
Living area fraction									fLA = Living area / (4) =			0.2917	(91)
MIT	19.5389	18.8693	19.2163	19.7420	20.1360	20.4194	20.4997	20.4943	20.3377	19.8531	19.2207	18.9033	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5389	18.8693	19.2163	19.7420	20.1360	20.4194	20.4997	20.4943	20.3377	19.8531	19.2207	18.9033	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9183	0.8843	0.8537	0.7848	0.6839	0.5254	0.3873	0.4163	0.6061	0.7890	0.8747	0.9157	(94)
Useful gains	675.4440	705.3756	699.2145	673.1212	592.9097	447.3036	316.3887	327.2726	461.4337	568.2396	621.2645	653.2601	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1397.3507	1273.0931	1151.7731	951.6057	735.7017	491.1839	329.1544	343.2809	533.4864	806.9605	1070.6342	1315.2486	(97)
Space heating kWh	537.0986	381.5062	336.7036	200.5088	106.2373	0.0000	0.0000	0.0000	0.0000	177.6084	323.5461	492.5194	(98a)
Space heating requirement - total per year (kWh/year)												2555.7284	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	537.0986	381.5062	336.7036	200.5088	106.2373	0.0000	0.0000	0.0000	0.0000	177.6084	323.5461	492.5194	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2555.7284	
Space heating per m2											(98c) / (4) =	21.2552	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	280.7591	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	537.0986	381.5062	336.7036	200.5088	106.2373	0.0000	0.0000	0.0000	0.0000	177.6084	323.5461	492.5194	(98)
Space heating efficiency (main heating system 1)	280.7591	280.7591	280.7591	280.7591	280.7591	0.0000	0.0000	0.0000	0.0000	280.7591	280.7591	280.7591	(210)
Space heating fuel (main heating system)	191.3023	135.8838	119.9262	71.4167	37.8393	0.0000	0.0000	0.0000	0.0000	63.2601	115.2398	175.4242	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	283.1519	250.3096	265.5259	232.3519	224.5210	201.5227	198.2408	206.5027	209.2155	234.2546	250.2883	279.9007	(64)
Efficiency of water heater												279.7171	(216)
(217)m	279.7171	279.7171	279.7171	279.7171	279.7171	279.7171	279.7171	279.7171	279.7171	279.7171	279.7171	279.7171	(217)
Fuel for water heating, kWh/month	101.2280	89.4867	94.9266	83.0668	80.2672	72.0452	70.8719	73.8256	74.7954	83.7470	89.4791	100.0656	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	45.0156	40.6593	45.0156	43.5635	45.0156	43.5635	45.0156	45.0156	43.5635	45.0156	43.5635	45.0156	(231)
Lighting	37.6608	30.2129	27.2034	19.9304	15.3948	12.5777	14.0436	18.2544	23.7107	31.1097	35.1384	38.7075	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													

(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	910.2924	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	279.7171	
Water heating fuel used	1013.8051	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.3580)		
mechanical ventilation fans (SFP = 1.3580)	530.0227	(230a)
Total electricity for the above, kWh/year	530.0227	(231)
Electricity for lighting (calculated in Appendix L)	303.9443	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2758.0644	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	910.2924	0.1550	141.0785	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1013.8051	0.1410	142.9330	(264)
Space and water heating			284.0115	(265)
Pumps, fans and electric keep-hot	530.0227	0.1387	73.5207	(267)
Energy for lighting	303.9443	0.1443	43.8686	(268)
Total CO2, kg/year			401.4007	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.3400	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	910.2924	1.5738	1432.5752	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1013.8051	1.5213	1542.3237	(278)
Space and water heating			2974.8990	(279)
Pumps, fans and electric keep-hot	530.0227	1.5128	801.8183	(281)
Energy for lighting	303.9443	1.5338	466.1999	(282)
Total Primary energy kWh/year			4242.9172	(286)
Dwelling Primary energy Rate (DPER)			35.2900	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

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1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor	47.0600 (1b)	x	2.4800 (2b)	=	116.7088	(1b) - (3b)	
First floor	49.7800 (1c)	x	2.7800 (2c)	=	138.3884	(1c) - (3c)	
Second floor	23.4000 (1d)	x	2.7700 (2d)	=	64.8180	(1d) - (3d)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	120.2400					(4)	
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	319.9152	(5)	

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	4 * 10 =	40.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1250	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	

Measured/design AP50	5.0000	(17)
Infiltration rate	0.3750	(18)
Number of sides sheltered	2	(19)
Shelter factor (20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) =	0.3188	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4064	0.3985	0.3905	0.3507	0.3427	0.3028	0.3028	0.2949	0.3188	0.3427	0.3586	0.3746	(22b)
Effective ac	0.5826	0.5794	0.5762	0.5615	0.5587	0.5459	0.5459	0.5435	0.5508	0.5587	0.5643	0.5701	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			4.1400	1.0000	4.1400			(26)
TER Opening Type			9.3900	1.1450	10.7519			(27)
GF			47.0600	0.1300	6.1178			(28a)
Exposed Floor			2.7200	0.1300	0.3536			(28b)
Main	129.1100	13.5300	115.5800	0.1800	20.8044			(29a)
Dwarf Wall (PIRx0.72)	16.7700		16.7700	0.1800	3.0186			(29a)
PIJ	15.5100		15.5100	0.1100	1.7061			(30)
PIR	17.5400		17.5400	0.1100	1.9294			(30)
Residual Ceiling	26.3800		26.3800	0.1100	2.9018			(30)
Total net area of external elements Aum(A, m2)			255.0900					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		51.7236			(33)
Main dwelling								
Party Wall 1			47.6000	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 77.1945 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	9.3200	0.0500	0.4660
E3 Sill	9.3200	0.0500	0.4660
E4 Jamb	30.6000	0.0500	1.5300
E5 Ground floor (normal)	20.0500	0.1600	3.2080
E11 Eaves (insulation at rafter level)	18.1000	0.0400	0.7240
E16 Corner (normal)	24.0800	0.0900	2.1672
E12 Gable (insulation at ceiling level)	5.6600	0.0600	0.3396
E6 Intermediate floor within a dwelling	39.5500	0.0000	0.0000
E17 Corner (inverted - internal area greater than external area)	2.4800	-0.0900	-0.2232
P1 Party wall - Ground floor	9.0500	0.0800	0.7240
E20 Exposed floor (normal)	3.3800	0.3200	1.0816
E21 Exposed floor (inverted)	3.3800	0.3200	1.0816
E13 Gable (insulation at rafter level)	8.2800	0.0800	0.6624
E18 Party wall between dwellings	10.5200	0.0600	0.6312
R6 Flat ceiling	18.1000	0.0600	1.0860

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	13.9444	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	65.6680	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	61.5060	61.1674	60.8355	59.2766	58.9849	57.6271	57.6271	57.3757	58.1501	58.9849	59.5749	60.1918	(38)
Heat transfer coeff	127.1740	126.8354	126.5035	124.9446	124.6529	123.2951	123.2951	123.0437	123.8181	124.6529	125.2429	125.8598	(39)
Average = Sum(39)m / 12 =												124.9432	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0577	1.0549	1.0521	1.0391	1.0367	1.0254	1.0254	1.0233	1.0298	1.0367	1.0416	1.0467	(40)
HLP (average)												1.0391	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.8642	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	72.2437	71.1580	69.5759	66.5490	64.3151	61.8240	60.4080	61.9781	63.6992	66.3739	69.4659	71.9669	(42a)
Hot water usage for baths	31.1904	30.7271	30.0748	28.8721	27.9715	26.9729	26.4334	27.0812	27.7865	28.8550	30.0826	31.0849	(42b)
Hot water usage for other uses	43.9627	42.3640	40.7654	39.1667	37.5681	35.9694	35.9694	37.5681	39.1667	40.7654	42.3640	43.9627	(42c)
Average daily hot water use (litres/day)												135.4907	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	147.3967	144.2491	140.4161	134.5878	129.8547	124.7663	122.8109	126.6274	130.6524	135.9943	141.9125	147.0144	(44)
Energy conte	233.4403	205.4088	215.8143	184.2439	174.8094	153.4147	148.5292	156.7911	161.1075	184.5430	202.1803	230.1891	(45)
Energy content (annual)										Total = Sum(45)m =		2250.4717	
Distribution loss (46)m = 0.15 x (45)m	35.0160	30.8113	32.3722	27.6366	26.2214	23.0122	22.2794	23.5187	24.1661	27.6815	30.3271	34.5284	(46)

Water storage loss:		
Store volume	210.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):	1.7016	(48)
Temperature factor from Table 2b	0.5400	(49)
Enter (49) or (54) in (55)	0.9188	(55)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Total storage loss	28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842	(56)
If cylinder contains dedicated solar storage	28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	285.1869	252.1477	267.5609	234.3213	226.5560	203.4920	200.2757	208.5377	211.1848	236.2896	252.2577	281.9357	(62)
WWHRS	-33.0268	-29.2092	-30.5861	-25.3265	-23.6034	-20.1976	-18.9320	-20.1323	-20.8972	-24.6355	-27.9091	-32.4152	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	252.1601	222.9385	236.9748	208.9947	202.9525	183.2944	181.3437	188.4054	190.2876	211.6541	224.3486	249.5205	(64)

Total per year (kWh/year) = Sum(64)m = 2552.8750 (64)

12Total per year (kWh/year) 2553 (64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

119.0162	105.6895	113.1555	101.3230	99.5214	91.0723	90.7832	93.5303	93.6301	102.7578	107.2868	117.9351	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

174.6158	193.3247	174.6158	180.4363	174.6158	180.4363	174.6158	174.6158	180.4363	174.6158	180.4363	174.6158	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

285.5253	288.4881	281.0218	265.1269	245.0625	226.2048	213.6066	210.6438	218.1101	234.0050	254.0694	272.9272	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	(69)

Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	(71)

Water heating gains (Table 5)

159.9680	157.2761	152.0908	140.7264	133.7653	126.4893	122.0205	125.7128	130.0418	138.1154	149.0095	158.5150	(72)

Total internal gains

689.0726	708.0524	676.6920	655.2532	622.4072	599.0939	576.2064	576.9359	594.5518	615.6997	652.4788	675.0215	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	5.8000	19.6403	0.6300	0.7000	0.7700	34.8135	(76)
South	0.7800	46.7521	0.6300	0.7000	0.7700	11.1447	(78)
West	2.8100	19.6403	0.6300	0.7000	0.7700	16.8665	(80)

Solar gains	62.8246	119.3491	189.7423	269.0966	324.9668	330.9824	315.7680	274.1278	217.9248	139.6467	77.6491	52.1291	(83)
Total gains	751.8973	827.4015	866.4343	924.3498	947.3739	930.0763	891.9745	851.0637	812.4766	755.3464	730.1279	727.1506	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	20.2738	20.3279	20.3812	20.6355	20.6838	20.9116	20.9116	20.9543	20.8233	20.6838	20.5864	20.4855	
alpha	2.3516	2.3552	2.3587	2.3757	2.3789	2.3941	2.3941	2.3970	2.3882	2.3789	2.3724	2.3657	
util living area													
	0.9420	0.9256	0.9022	0.8509	0.7713	0.6455	0.5193	0.5533	0.7224	0.8624	0.9219	0.9460	(86)
MIT	18.1105	18.3918	18.8463	19.5080	20.1174	20.6095	20.8359	20.8030	20.4476	19.6717	18.8057	18.0746	(87)
Th 2	20.0356	20.0379	20.0401	20.0509	20.0529	20.0622	20.0622	20.0639	20.0586	20.0529	20.0488	20.0446	(88)
util rest of house													
	0.9351	0.9167	0.8898	0.8306	0.7365	0.5855	0.4320	0.4683	0.6702	0.8397	0.9112	0.9396	(89)
MIT 2	16.6355	16.9918	17.5672	18.3998	19.1453	19.7201	19.9519	19.9251	19.5464	18.6152	17.5266	16.5949	(90)
Living area fraction									fLA = Living area / (4) =			0.2917	(91)
MIT	17.0658	17.4002	17.9404	18.7231	19.4289	19.9796	20.2098	20.1812	19.8093	18.9234	17.8998	17.0266	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.0658	17.4002	17.9404	18.7231	19.4289	19.9796	20.2098	20.1812	19.8093	18.9234	17.8998	17.0266	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9049	0.8835	0.8543	0.7956	0.7099	0.5797	0.4467	0.4798	0.6544	0.8057	0.8782	0.9106	(94)
Useful gains	680.4244	731.0085	740.2288	735.4573	672.5797	539.1931	398.4571	408.3412	531.7080	608.5915	641.1902	662.1466	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1623.4794	1585.4708	1447.2461	1227.3451	963.4317	663.2744	445.0757	465.2531	706.9170	1037.5375	1352.5970	1614.3529	(97)
Space heating kWh													
	701.6329	574.1987	526.0209	354.1592	216.3939	0.0000	0.0000	0.0000	0.0000	319.1358	512.2129	708.4415	(98a)

Space heating requirement - total per year (kWh/year) 3912.1958

Solar heating kWh

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)

Solar heating contribution - total per year (kWh/year) 0.0000

Space heating kWh

701.6329	574.1987	526.0209	354.1592	216.3939	0.0000	0.0000	0.0000	0.0000	319.1358	512.2129	708.4415	(98c)

Space heating requirement after solar contribution - total per year (kWh/year) 3912.1958

Space heating per m2 (98c) / (4) = 32.5366 (99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (201)

Fraction of space heat from main system(s) 1.0000 (202)

Efficiency of main space heating system 1 (in %) 92.3000 (206)

Efficiency of main space heating system 2 (in %) 0.0000 (207)

Efficiency of secondary/supplementary heating system, % 0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	701.6329	574.1987	526.0209	354.1592	216.3939	0.0000	0.0000	0.0000	0.0000	319.1358	512.2129	708.4415	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	760.1657	622.1004	569.9034	383.7045	234.4463	0.0000	0.0000	0.0000	0.0000	345.7593	554.9435	767.5423	(211)

Space heating efficiency (main heating system 2)												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating												
Water heating requirement												
252.1601	222.9385	236.9748	208.9947	202.9525	183.2944	181.3437	188.4054	190.2876	211.6541	224.3486	249.5205	(64)
Efficiency of water heater												
(217)m												79.8000 (216)
86.2289	86.0847	85.7948	85.2326	84.2039	79.8000	79.8000	79.8000	79.8000	84.9783	85.8508	86.2658	(217)
Fuel for water heating, kWh/month												
292.4310	258.9758	276.2113	245.2052	241.0252	229.6923	227.2477	236.0970	238.4556	249.0683	261.3237	289.2460	(219)
Space cooling fuel requirement												
(221)m												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa												
7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting												
36.2817	29.1065	26.2072	19.2005	14.8310	12.1171	13.5294	17.5860	22.8425	29.9705	33.8517	37.2901	(232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m												
-44.8351	-63.5977	-91.9124	-103.8503	-112.3250	-104.8897	-103.5753	-97.6460	-87.1929	-72.9770	-49.4256	-38.7153	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m												
-24.0700	-50.8073	-101.3344	-152.7222	-202.4756	-203.6983	-201.3212	-170.2092	-124.4164	-72.8467	-32.1932	-19.0216	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	4238.5653	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	3044.9791	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	292.8142	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-2326.0585	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	5336.3003	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	4238.5653	0.2100	890.0987	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3044.9791	0.2100	639.4456	(264)
Space and water heating			1529.5443	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	292.8142	0.1443	42.2621	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-970.9424	0.1345	-130.5801	
PV Unit electricity exported	-1355.1161	0.1258	-170.4601	
Total			-301.0402	(269)
Total CO2, kg/year			1282.6956	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.6700	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	4238.5653	1.1300	4789.5788	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3044.9791	1.1300	3440.8264	(278)
Space and water heating			8230.4053	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	292.8142	1.5338	449.1283	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-970.9424	1.4970	-1453.5394	
PV Unit electricity exported	-1355.1161	0.4617	-625.6980	
Total			-2079.2374	(283)
Total Primary energy kWh/year			6730.3969	(286)
Target Primary Energy Rate (TPER)			55.9700	(287)

Full SAP Calculation Printout

Property Reference	78449-13	**Issued on Date**	03/10/2025
Assessment Reference	001	**Prop Type Ref**	End
Property	830 Rochdale Road, MANCHESTER, M9 8FA		

SAP Rating	84 B	**DER**	3.34	**TER**	10.67
Environmental	97 A	**% DER < TER**			68.70
CO_2 Emissions (t/year)	0.38	**DFEE**	33.38	**TFEE**	37.89
Compliance Check	See BREL	**% DFEE < TFEE**			11.92
% DPER < TPER	36.95	**DPER**	35.29	**TPER**	55.97

Assessor Details	Mr. Daniel Goddard	**Assessor ID**	CP52-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.0600 (1b)	x	2.4800 (2b)	=	116.7088	(1b) - (3b)
First floor	49.7800 (1c)	x	2.7800 (2c)	=	138.3884	(1c) - (3c)
Second floor	23.4000 (1d)	x	2.7700 (2d)	=	64.8180	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	120.2400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	319.9152	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	4 * 10 =	40.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1250	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3750	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3188	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4064	0.3985	0.3905	0.3507	0.3427	0.3028	0.3028	0.2949	0.3188	0.3427	0.3586	0.3746	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5826	0.5794	0.5762	0.5615	0.5587	0.5459	0.5459	0.5435	0.5508	0.5587	0.5643	0.5701	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door			4.1400	1.0000	4.1400			(26)
Window			9.3900	0.7752	7.2791			(27)
GF			47.0600	0.0900	4.2354	75.0000	3529.5000	(28a)
Exposed Floor			2.7200	0.1400	0.3808	20.0000	54.4000	(28b)
Main	129.1100	13.5300	115.5800	0.1300	15.0254	9.0000	1040.2200	(29a)
Dwarf Wall (PIRx0.72)	16.7700		16.7700	0.0900	1.5093	9.0000	150.9300	(29a)
PIJ	15.5100		15.5100	0.1300	2.0163	9.0000	139.5900	(30)
PIR	17.5400		17.5400	0.1300	2.2802	9.0000	157.8600	(30)
Residual Ceiling	26.3800		26.3800	0.0900	2.3742	9.0000	237.4200	(30)
Total net area of external elements Aum(A, m2)			255.0900					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		39.2407			(33)
Main dwelling								
Party Wall 1			47.6000	0.0000	0.0000	20.0000	952.0000	(32)
Timber			124.1700			9.0000	1117.5300	(32c)
FF			47.0600			18.0000	847.0800	(32d)
SF			23.4000			18.0000	421.2000	(32d)

GF	47.0600		9.0000	423.5400 (32e)
FF	23.4000		9.0000	210.6000 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 9281.8700 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 77.1945 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	9.3200	0.1150	1.0718
E3 Sill	9.3200	0.0170	0.1584
E4 Jamb	30.6000	0.0940	2.8764
E5 Ground floor (normal)	20.0500	0.0670	1.3434
E11 Eaves (insulation at rafter level)	18.1000	0.0250	0.4525
E16 Corner (normal)	24.0800	0.0680	1.6374
E12 Gable (insulation at ceiling level)	5.6600	0.0770	0.4358
E6 Intermediate floor within a dwelling	39.5500	0.0320	1.2656
E17 Corner (inverted - internal area greater than external area)	2.4800	-0.0290	-0.0719
P1 Party wall - Ground floor	9.0500	0.3200	2.8960
E20 Exposed floor (normal)	3.3800	0.0790	0.2670
E21 Exposed floor (inverted)	3.3800	0.0630	0.2129
E13 Gable (insulation at rafter level)	8.2800	0.0740	0.6127
E18 Party wall between dwellings	10.5200	0.0920	0.9678
R6 Flat ceiling	18.1000	-0.0430	-0.7783

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 13.3476 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 52.5883 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	61.5060	61.1674	60.8355	59.2766	58.9849	57.6271	57.6271	57.3757	58.1501	58.9849	59.5749	60.1918	(38)
Heat transfer coeff	114.0943	113.7557	113.4238	111.8649	111.5732	110.2154	110.2154	109.9640	110.7384	111.5732	112.1633	112.7801	(39)

Average = Sum(39)m / 12 = 111.8635

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9489	0.9461	0.9433	0.9303	0.9279	0.9166	0.9166	0.9145	0.9210	0.9279	0.9328	0.9380	(40)
HLP (average)												0.9303	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.8642 (42)
Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

31.1904	30.7271	30.0748	28.8721	27.9715	26.9729	26.4334	27.0812	27.7865	28.8550	30.0826	31.0849	(42b)

Hot water usage for other uses

43.9627	42.3640	40.7654	39.1667	37.5681	35.9694	35.9694	37.5681	39.1667	40.7654	42.3640	43.9627	(42c)

Average daily hot water use (litres/day) 68.8844 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	75.1530	73.0911	70.8402	68.0388	65.5396	62.9423	62.4029	64.6493	66.9532	69.6204	72.4466	75.0476	(44)
Energy conte	119.0240	104.0808	108.8787	93.1417	88.2288	77.3949	75.4709	80.0493	82.5600	94.4742	103.2134	117.5064	(45)

Energy content (annual) Total = Sum(45)m = 1144.0232
Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss:
Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

101.1704	88.4687	92.5469	79.1705	74.9945	65.7857	64.1503	68.0419	70.1760	80.3031	87.7314	99.8804	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

101.1704	88.4687	92.5469	79.1705	74.9945	65.7857	64.1503	68.0419	70.1760	80.3031	87.7314	99.8804	(64)

Total per year (kWh/year) = Sum(64)m = 972.4197 (64)
12Total per year (kWh/year) 972 (64)
Electric shower(s)

57.8551	51.5494	56.2900	53.7168	54.7248	52.2022	53.9422	54.7248	53.7168	56.2900	55.2315	57.8551	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 658.0987 (64a)
Heat gains from water heating, kWh/month

39.7564	35.0045	37.2092	33.2218	32.4298	29.4970	29.5231	30.6917	30.9732	34.1483	35.7407	39.4339	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	178.7463	197.8977	178.7463	184.7045	178.7463	184.7045	178.7463	178.7463	184.7045	178.7463	184.7045	178.7463	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	285.5253	288.4881	281.0218	265.1269	245.0625	226.2048	213.6066	210.6438	218.1101	234.0050	254.0694	272.9272	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		(70)
Losses e.g. evaporation (negative values) (Table 5)	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	(71)
Water heating gains (Table 5)	53.4360	52.0901	50.0124	46.1414	43.5885	40.9680	39.6816	41.2523	43.0183	45.8982	49.6399	53.0025	(72)
Total internal gains	583.6711	604.4394	575.7441	561.9364	533.3608	517.8408	497.9981	496.6059	511.7965	524.6130	554.3773	570.6395	(73)

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6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains

	m2	Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	factor Table 6d	W	
East	5.8000	19.6403	0.3000	0.0000	0.7700	26.3140	(76)
South	0.7800	46.7521	0.3000	0.0000	0.7700	8.4238	(78)
West	2.8100	19.6403	0.3000	0.0000	0.7700	12.7487	(80)

Solar gains	47.4865	90.2110	143.4182	203.3988	245.6287	250.1756	238.6758	207.2016	164.7202	105.5531	58.6917	39.4022 (83)
Total gains	631.1576	694.6504	719.1623	765.3352	778.9895	768.0164	736.6738	703.8075	676.5166	630.1661	613.0690	610.0417 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	22.5979	22.6652	22.7315	23.0483	23.1086	23.3933	23.3933	23.4467	23.2828	23.1086	22.9870	22.8613	
alpha	2.5065	2.5110	2.5154	2.5366	2.5406	2.5596	2.5596	2.5631	2.5522	2.5406	2.5325	2.5241	
util living area	0.9572	0.9437	0.9257	0.8820	0.8113	0.6879	0.5587	0.5934	0.7607	0.8905	0.9407	0.9605	(86)
MIT	18.2175	18.4824	18.9017	19.5372	20.1246	20.6159	20.8408	20.8085	20.4600	19.7069	18.8846	18.1880	(87)
Th 2	20.1261	20.1285	20.1308	20.1418	20.1438	20.1534	20.1534	20.1552	20.1497	20.1438	20.1397	20.1354	(88)
util rest of house	0.9521	0.9371	0.9163	0.8658	0.7820	0.6336	0.4764	0.5140	0.7150	0.8724	0.9326	0.9558	(89)
MIT 2	17.5501	17.8133	18.2294	18.8592	19.4253	19.8813	20.0651	20.0441	19.7465	19.0323	18.2214	17.5268	(90)
Living area fraction										fLA = Living area / (4) =		0.2917	(91)
MIT	17.7448	18.0085	18.4255	19.0570	19.6293	20.0956	20.2914	20.2671	19.9547	19.2291	18.4149	17.7197	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.7448	18.0085	18.4255	19.0570	19.6293	20.0956	20.2914	20.2671	19.9547	19.2291	18.4149	17.7197	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9335	0.9158	0.8928	0.8408	0.7616	0.6295	0.4907	0.5254	0.7030	0.8485	0.9113	0.9381	(94)
Useful gains	589.1882	636.1501	642.0463	643.5293	593.2587	483.5016	361.5181	369.7631	475.6162	534.7121	558.7096	572.3000	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1533.9767	1491.1718	1352.6370	1136.2100	884.6982	605.7036	406.8517	425.2428	648.3380	962.7773	1269.1179	1524.7522	(97)
Space heating kWh	702.9227	574.5746	528.6795	354.7301	216.8310	0.0000	0.0000	0.0000	0.0000	318.4805	511.4940	708.6245	(98a)
Space heating requirement - total per year (kWh/year)												3916.3368	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	702.9227	574.5746	528.6795	354.7301	216.8310	0.0000	0.0000	0.0000	0.0000	318.4805	511.4940	708.6245	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3916.3368	
Space heating per m2											(98c) / (4) =	32.5710	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	1036.0249	815.5941	835.7262	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.6208	0.6965	0.6703	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	643.1685	568.0626	560.1809	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	798.9741	766.7027	732.1302	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	112.1800	147.7882	127.9303	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	28.0450	36.9471	31.9826	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												96.9746	(107)
Energy for space heating												32.5710	(99)
Energy for space cooling												0.8065	(108)
Total												33.3775	(109)
Fabric Energy Efficiency (DFEE)												33.4	(109)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.0600	(1b)	x 2.4800	(2b) =	116.7088	(1b) - (3b)
First floor	49.7800	(1c)	x 2.7800	(2c) =	138.3884	(1c) - (3c)
Second floor	23.4000	(1d)	x 2.7700	(2d) =	64.8180	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	120.2400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		319.9152	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	4 * 10 =	40.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1250	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3750	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3188	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4064	0.3985	0.3905	0.3507	0.3427	0.3028	0.3028	0.2949	0.3188	0.3427	0.3586	0.3746	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5826	0.5794	0.5762	0.5615	0.5587	0.5459	0.5459	0.5435	0.5508	0.5587	0.5643	0.5701	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			4.1400	1.0000	4.1400			(26)
TER Opening Type			9.3900	1.1450	10.7519			(27)
GF			47.0600	0.1300	6.1178			(28a)
Exposed Floor			2.7200	0.1300	0.3536			(28b)
Main	129.1100	13.5300	115.5800	0.1800	20.8044			(29a)
Dwarf Wall (PIRx0.72)	16.7700		16.7700	0.1800	3.0186			(29a)
PIJ	15.5100		15.5100	0.1100	1.7061			(30)
PIR	17.5400		17.5400	0.1100	1.9294			(30)
Residual Ceiling	26.3800		26.3800	0.1100	2.9018			(30)
Total net area of external elements Aum(A, m2)			255.0900					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		51.7236			(33)
Main dwelling								
Party Wall 1			47.6000	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		77.1945	(35)
List of Thermal Bridges			
K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	9.3200	0.0500	0.4660
E3 Sill	9.3200	0.0500	0.4660
E4 Jamb	30.6000	0.0500	1.5300
E5 Ground floor (normal)	20.0500	0.1600	3.2080
E11 Eaves (insulation at rafter level)	18.1000	0.0400	0.7240
E16 Corner (normal)	24.0800	0.0900	2.1672
E12 Gable (insulation at ceiling level)	5.6600	0.0600	0.3396
E6 Intermediate floor within a dwelling	39.5500	0.0000	0.0000
E17 Corner (inverted - internal area greater than external area)	2.4800	-0.0900	-0.2232
P1 Party wall - Ground floor	9.0500	0.0800	0.7240
E20 Exposed floor (normal)	3.3800	0.3200	1.0816
E21 Exposed floor (inverted)	3.3800	0.3200	1.0816
E13 Gable (insulation at rafter level)	8.2800	0.0800	0.6624
E18 Party wall between dwellings	10.5200	0.0600	0.6312
R6 Flat ceiling	18.1000	0.0600	1.0860
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			13.9444 (36)
Point Thermal bridges		(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =		65.6680 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	61.5060	61.1674	60.8355	59.2766	58.9849	57.6271	57.6271	57.3757	58.1501	58.9849	59.5749	60.1918	(38)
Heat transfer coeff	127.1740	126.8354	126.5035	124.9446	124.6529	123.2951	123.2951	123.0437	123.8181	124.6529	125.2429	125.8598	(39)
Average = Sum(39)m / 12 =												124.9432	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0577	1.0549	1.0521	1.0391	1.0367	1.0254	1.0254	1.0233	1.0298	1.0367	1.0416	1.0467	(40)
HLP (average)												1.0391	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.8642	(42)
Hot water usage for mixer showers	0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000		(42a)
Hot water usage for baths	31.1904 30.7271 30.0748 28.8721 27.9715 26.9729 26.4334 27.0812 27.7865 28.8550 30.0826 31.0849		(42b)
Hot water usage for other uses	43.9627 42.3640 40.7654 39.1667 37.5681 35.9694 35.9694 37.5681 39.1667 40.7654 42.3640 43.9627		(42c)
Average daily hot water use (litres/day)		68.8844	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	75.1530	73.0911	70.8402	68.0388	65.5396	62.9423	62.4029	64.6493	66.9532	69.6204	72.4466	75.0476	(44)
Energy conte	119.0240	104.0808	108.8787	93.1417	88.2288	77.3949	75.4709	80.0493	82.5600	94.4742	103.2134	117.5064	(45)
Energy content (annual)										Total = Sum(45)m =		1144.0232	
Distribution loss (46)m = 0.15 x (45)m													

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	101.1704	88.4687	92.5469	79.1705	74.9945	65.7857	64.1503	68.0419	70.1760	80.3031	87.7314	99.8804	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	101.1704	88.4687	92.5469	79.1705	74.9945	65.7857	64.1503	68.0419	70.1760	80.3031	87.7314	99.8804	(64)
									Total per year (kWh/year) = Sum(64)m =			972.4197	(64)
12Total per year (kWh/year)												972	(64)
Electric shower(s)													
	57.8551	51.5494	56.2900	53.7168	54.7248	52.2022	53.9422	54.7248	53.7168	56.2900	55.2315	57.8551	(64a)
								Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =				658.0987	(64a)
Heat gains from water heating, kWh/month													
	39.7564	35.0045	37.2092	33.2218	32.4298	29.4970	29.5231	30.6917	30.9732	34.1483	35.7407	39.4339	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	174.6158	193.3247	174.6158	180.4363	174.6158	180.4363	174.6158	174.6158	180.4363	174.6158	180.4363	174.6158	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	285.5253	288.4881	281.0218	265.1269	245.0625	226.2048	213.6066	210.6438	218.1101	234.0050	254.0694	272.9272	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	(71)
Water heating gains (Table 5)													
	53.4360	52.0901	50.0124	46.1414	43.5885	40.9680	39.6816	41.2523	43.0183	45.8982	49.6399	53.0025	(72)
Total internal gains													
	579.5407	599.8664	571.6136	557.6683	529.2304	513.5726	493.8676	492.4754	507.5283	520.4825	550.1092	566.5091	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	5.8000	19.6403	0.6300	0.7000	0.7700	34.8135	(76)
South	0.7800	46.7521	0.6300	0.7000	0.7700	11.1447	(78)
West	2.8100	19.6403	0.6300	0.7000	0.7700	16.8665	(80)

Solar gains	62.8246	119.3491	189.7423	269.0966	324.9668	330.9824	315.7680	274.1278	217.9248	139.6467	77.6491	52.1291	(83)
Total gains	642.3653	719.2155	761.3559	826.7649	854.1971	844.5550	809.6356	766.6032	725.4531	660.1292	627.7583	618.6382	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	20.2738	20.3279	20.3812	20.6355	20.6838	20.9116	20.9116	20.9543	20.8233	20.6838	20.5864	20.4855	
alpha	2.3516	2.3552	2.3587	2.3757	2.3789	2.3941	2.3941	2.3970	2.3882	2.3789	2.3724	2.3657	
util living area													
	0.9573	0.9428	0.9224	0.8758	0.8023	0.6811	0.5560	0.5932	0.7600	0.8902	0.9413	0.9607	(86)
MIT	17.9200	18.2125	18.6839	19.3794	20.0240	20.5574	20.8089	20.7695	20.3742	19.5405	18.6367	17.8828	(87)
Th 2	20.0356	20.0379	20.0401	20.0509	20.0529	20.0622	20.0622	20.0639	20.0586	20.0529	20.0488	20.0446	(88)
util rest of house													
	0.9520	0.9357	0.9122	0.8579	0.7701	0.6222	0.4665	0.5068	0.7108	0.8710	0.9328	0.9559	(89)
MIT 2	17.1989	17.4893	17.9565	18.6438	19.2633	19.7560	19.9604	19.9350	19.5998	18.8103	17.9194	17.1678	(90)
Living area fraction										fLA = Living area / (4) =		0.2917	(91)
MIT	17.4093	17.7003	18.1687	18.8584	19.4852	19.9898	20.2080	20.1785	19.8257	19.0234	18.1286	17.3764	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.4093	17.7003	18.1687	18.8584	19.4852	19.9898	20.2080	20.1785	19.8257	19.0234	18.1286	17.3764	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9320	0.9124	0.8861	0.8302	0.7475	0.6172	0.4815	0.5184	0.6967	0.8445	0.9097	0.9369	(94)
Useful gains	598.6570	656.2422	674.6323	686.4069	638.5208	521.2221	389.8551	397.3890	505.4287	557.4760	571.0566	579.5915	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1667.1625	1623.5276	1476.1321	1244.2531	970.4496	664.5398	444.8444	464.9146	708.9504	1049.9969	1381.2596	1658.3816	(97)
Space heating kWh													
	794.9681	650.0157	596.3158	401.6493	246.9550	0.0000	0.0000	0.0000	0.0000	366.4355	583.3462	802.6199	(98a)
Space heating requirement - total per year (kWh/year)												4442.3055	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	794.9681	650.0157	596.3158	401.6493	246.9550	0.0000	0.0000	0.0000	0.0000	366.4355	583.3462	802.6199	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4442.3055	
Space heating per m2											(98c) / (4) =	36.9453	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	1158.9740	912.3838	935.1319	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.6092	0.6827	0.6534	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	706.0721	622.9178	611.0060	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	893.0621	856.4200	809.8480	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	134.6328	173.7257	147.9384	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	33.6582	43.4314	36.9846	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												114.0742	(107)
Energy for space heating												36.9453	(99)
Energy for space cooling												0.9487	(108)
Total												37.8940	(109)
Fabric Energy Efficiency (TFEE)												37.9	(109)

Full SAP Calculation Printout

Property Reference	78449-13	**Issued on Date**	03/10/2025
Assessment Reference	001	**Prop Type Ref**	End
Property	830 Rochdale Road, MANCHESTER, M9 8FA		

SAP Rating	84 B	**DER**	3.34	**TER**	10.67
Environmental	97 A	**% DER < TER**			68.70
CO_2 Emissions (t/year)	0.38	**DFEE**	33.38	**TFEE**	37.89
Compliance Check	See BREL	**% DFEE < TFEE**			11.92
% DPER < TPER	36.95	**DPER**	35.29	**TPER**	55.97

Assessor Details	Mr. Daniel Goddard	**Assessor ID**	CP52-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.0600 (1b)	x	2.4800 (2b)	=	116.7088	(1b) - (3b)
First floor	49.7800 (1c)	x	2.7800 (2c)	=	138.3884	(1c) - (3c)
Second floor	23.4000 (1d)	x	2.7700 (2d)	=	64.8180	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	120.2400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	319.9152	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.2500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2125	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2709	0.2656	0.2603	0.2338	0.2284	0.2019	0.2019	0.1966	0.2125	0.2284	0.2391	0.2497	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	80.1000 (23c)

Effective ac	0.3704	0.3651	0.3598	0.3332	0.3279	0.3014	0.3014	0.2961	0.3120	0.3279	0.3386	0.3492	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door			4.1400	1.0000	4.1400			(26)
Window			9.3900	0.7752	7.2791			(27)
GF			47.0600	0.0900	4.2354	75.0000	3529.5000	(28a)
Exposed Floor			2.7200	0.1400	0.3808	20.0000	54.4000	(28b)
Main	129.1100	13.5300	115.5800	0.1300	15.0254	9.0000	1040.2200	(29a)
Dwarf Wall (PIRx0.72)	16.7700		16.7700	0.0900	1.5093	9.0000	150.9300	(29a)
PIJ	15.5100		15.5100	0.1300	2.0163	9.0000	139.5900	(30)
PIR	17.5400		17.5400	0.1300	2.2802	9.0000	157.8600	(30)
Residual Ceiling	26.3800		26.3800	0.0900	2.3742	9.0000	237.4200	(30)
Total net area of external elements Aum(A, m2)			255.0900					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		39.2407			(33)
Main dwelling								
Party Wall 1			47.6000	0.0000	0.0000	20.0000	952.0000	(32)

Timber	124.1700		9.0000	1117.5300 (32c)
FF	47.0600		18.0000	847.0800 (32d)
SF	23.4000		18.0000	421.2000 (32d)
GF	47.0600		9.0000	423.5400 (32e)
FF	23.4000		9.0000	210.6000 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 9281.8700 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 77.1945 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	9.3200	0.1150	1.0718
E3 Sill	9.3200	0.0170	0.1584
E4 Jamb	30.6000	0.0940	2.8764
E5 Ground floor (normal)	20.0500	0.0670	1.3434
E11 Eaves (insulation at rafter level)	18.1000	0.0250	0.4525
E16 Corner (normal)	24.0800	0.0680	1.6374
E12 Gable (insulation at ceiling level)	5.6600	0.0770	0.4358
E6 Intermediate floor within a dwelling	39.5500	0.0320	1.2656
E17 Corner (inverted - internal area greater than external area)	2.4800	-0.0290	-0.0719
P1 Party wall - Ground floor	9.0500	0.3200	2.8960
E20 Exposed floor (normal)	3.3800	0.0790	0.2670
E21 Exposed floor (inverted)	3.3800	0.0630	0.2129
E13 Gable (insulation at rafter level)	8.2800	0.0740	0.6127
E18 Party wall between dwellings	10.5200	0.0920	0.9678
R6 Flat ceiling	18.1000	-0.0430	-0.7783

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 13.3476 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 52.5883 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	39.1078	38.5470	37.9861	35.1819	34.6210	31.8168	31.8168	31.2559	32.9385	34.6210	35.7427	36.8644	(38)
Heat transfer coeff	91.6962	91.1353	90.5745	87.7702	87.2093	84.4051	84.4051	83.8442	85.5268	87.2093	88.3310	89.4527	(39)
Average = Sum(39)m / 12 =												87.6300	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7626	0.7579	0.7533	0.7300	0.7253	0.7020	0.7020	0.6973	0.7113	0.7253	0.7346	0.7440	(40)
HLP (average)												0.7288	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.8642 (42)
Hot water usage for mixer showers

72.2437	71.1580	69.5759	66.5490	64.3151	61.8240	60.4080	61.9781	63.6992	66.3739	69.4659	71.9669	(42a)

Hot water usage for baths

31.1904	30.7271	30.0748	28.8721	27.9715	26.9729	26.4334	27.0812	27.7865	28.8550	30.0826	31.0849	(42b)

Hot water usage for other uses

43.9627	42.3640	40.7654	39.1667	37.5681	35.9694	35.9694	37.5681	39.1667	40.7654	42.3640	43.9627	(42c)

Average daily hot water use (litres/day) 135.4907 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	147.3967	144.2491	140.4161	134.5878	129.8547	124.7663	122.8109	126.6274	130.6524	135.9943	141.9125	147.0144	(44)
Energy conte	233.4403	205.4088	215.8143	184.2439	174.8094	153.4147	148.5292	156.7911	161.1075	184.5430	202.1803	230.1891	(45)
Energy content (annual)										Total = Sum(45)m =		2250.4717	
Distribution loss (46)m = 0.15 x (45)m	35.0160	30.8113	32.3722	27.6366	26.2214	23.0122	22.2794	23.5187	24.1661	27.6815	30.3271	34.5284	(46)
Water storage loss:													
Store volume												210.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5800	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8532	(55)
Total storage loss	26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(56)
If cylinder contains dedicated solar storage	26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	283.1519	250.3096	265.5259	232.3519	224.5210	201.5227	198.2408	206.5027	209.2155	234.2546	250.2883	279.9007	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	283.1519	250.3096	265.5259	232.3519	224.5210	201.5227	198.2408	206.5027	209.2155	234.2546	250.2883	279.9007	(64)
										Total per year (kWh/year) = Sum(64)m =		2835.7857	(64)
12Total per year (kWh/year)												2836	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	117.3882	104.2191	111.5276	99.7475	97.8934	89.4968	89.1552	91.9023	92.0546	101.1298	105.7114	116.3071	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	178.7463	197.8977	178.7463	184.7045	178.7463	184.7045	178.7463	178.7463	184.7045	178.7463	184.7045	178.7463	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	285.5253	288.4881	281.0218	265.1269	245.0625	226.2048	213.6066	210.6438	218.1101	234.0050	254.0694	272.9272	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	(71)
Water heating gains (Table 5)	157.7798	155.0879	149.9026	138.5382	131.5771	124.3011	119.8323	123.5246	127.8537	135.9272	146.8213	156.3268	(72)
Total internal gains	688.0149	707.4373	675.6343	654.3332	621.3495	601.1739	578.1487	578.8782	596.6318	614.6420	651.5588	673.9638	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	5.8000	19.6403	0.3000	0.0000	0.7700	26.3140	(76)
South	0.7800	46.7521	0.3000	0.0000	0.7700	8.4238	(78)
West	2.8100	19.6403	0.3000	0.0000	0.7700	12.7487	(80)

Solar gains	47.4865	90.2110	143.4182	203.3988	245.6287	250.1756	238.6758	207.2016	164.7202	105.5531	58.6917	39.4022	(83)
Total gains	735.5014	797.6482	819.0525	857.7320	866.9782	851.3495	816.8245	786.0799	761.3520	720.1951	710.2505	713.3660	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	28.1178	28.2909	28.4661	29.3755	29.5645	30.5467	30.5467	30.7510	30.1461	29.5645	29.1890	28.8230	
alpha	2.8745	2.8861	2.8977	2.9584	2.9710	3.0364	3.0364	3.0501	3.0097	2.9710	2.9459	2.9215	
util living area	0.9330	0.9133	0.8861	0.8209	0.7227	0.5652	0.4310	0.4605	0.6486	0.8269	0.9050	0.9370	(86)
Living	19.0328	19.2765	19.6262	20.1537	20.5628	20.8585	20.9537	20.9430	20.7701	20.2620	19.6198	19.0405	
Non living	18.4596	18.7015	19.0475	19.5724	19.9602	20.2385	20.3127	20.3094	20.1595	19.6847	19.0563	18.4788	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	19.9936	19.2765	19.6262	20.1537	20.5628	20.8585	20.9537	20.9430	20.7701	20.2620	19.6198	19.3146	(87)
Th 2	20.2859	20.2899	20.2940	20.3144	20.3185	20.3391	20.3391	20.3432	20.3309	20.3185	20.3103	20.3022	(88)
util rest of house	0.9263	0.9048	0.8745	0.8022	0.6925	0.5197	0.3729	0.4027	0.6056	0.8055	0.8945	0.9308	(89)
MIT 2	19.3516	18.7015	19.0475	19.5724	19.9602	20.2385	20.3127	20.3094	20.1595	19.6847	19.0563	18.7339	(90)
Living area fraction									fLA = Living area / (4) =			0.2917	(91)
MIT	19.5389	18.8693	19.2163	19.7420	20.1360	20.4194	20.4997	20.4943	20.3377	19.8531	19.2207	18.9033	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5389	18.8693	19.2163	19.7420	20.1360	20.4194	20.4997	20.4943	20.3377	19.8531	19.2207	18.9033	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9183	0.8843	0.8537	0.7848	0.6839	0.5254	0.3873	0.4163	0.6061	0.7890	0.8747	0.9157	(94)
Useful gains	675.4440	705.3756	699.2145	673.1212	592.9097	447.3036	316.3887	327.2726	461.4337	568.2396	621.2645	653.2601	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1397.3507	1273.0931	1151.7731	951.6057	735.7017	491.1839	329.1544	343.2809	533.4864	806.9605	1070.6342	1315.2486	(97)
Space heating kWh	537.0986	381.5062	336.7036	200.5088	106.2373	0.0000	0.0000	0.0000	0.0000	177.6084	323.5461	492.5194	(98a)
Space heating requirement - total per year (kWh/year)												2555.7284	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	537.0986	381.5062	336.7036	200.5088	106.2373	0.0000	0.0000	0.0000	0.0000	177.6084	323.5461	492.5194	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2555.7284	
Space heating per m2											(98c) / (4) =	21.2552	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	280.7591	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	537.0986	381.5062	336.7036	200.5088	106.2373	0.0000	0.0000	0.0000	0.0000	177.6084	323.5461	492.5194	(98)
Space heating efficiency (main heating system 1)	280.7591	280.7591	280.7591	280.7591	280.7591	0.0000	0.0000	0.0000	0.0000	280.7591	280.7591	280.7591	(210)
Space heating fuel (main heating system)	191.3023	135.8838	119.9262	71.4167	37.8393	0.0000	0.0000	0.0000	0.0000	63.2601	115.2398	175.4242	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	283.1519	250.3096	265.5259	232.3519	224.5210	201.5227	198.2408	206.5027	209.2155	234.2546	250.2883	279.9007	(64)
Efficiency of water heater												279.7171	(216)
(217)m	279.7171	279.7171	279.7171	279.7171	279.7171	279.7171	279.7171	279.7171	279.7171	279.7171	279.7171	279.7171	(217)
Fuel for water heating, kWh/month	101.2280	89.4867	94.9266	83.0668	80.2672	72.0452	70.8719	73.8256	74.7954	83.7470	89.4791	100.0656	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	45.0156	40.6593	45.0156	43.5635	45.0156	43.5635	45.0156	45.0156	43.5635	45.0156	43.5635	45.0156	(231)
Lighting	37.6608	30.2129	27.2034	19.9304	15.3948	12.5777	14.0436	18.2544	23.7107	31.1097	35.1384	38.7075	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													

(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	910.2924	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	279.7171	
Water heating fuel used	1013.8051	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.3580)		
mechanical ventilation fans (SFP = 1.3580)	530.0227	(230a)
Total electricity for the above, kWh/year	530.0227	(231)
Electricity for lighting (calculated in Appendix L)	303.9443	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2758.0644	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	910.2924	0.1550	141.0785	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1013.8051	0.1410	142.9330	(264)
Space and water heating			284.0115	(265)
Pumps, fans and electric keep-hot	530.0227	0.1387	73.5207	(267)
Energy for lighting	303.9443	0.1443	43.8686	(268)
Total CO2, kg/year			401.4007	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.3400	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	910.2924	1.5738	1432.5752	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1013.8051	1.5213	1542.3237	(278)
Space and water heating			2974.8990	(279)
Pumps, fans and electric keep-hot	530.0227	1.5128	801.8183	(281)
Energy for lighting	303.9443	1.5338	466.1999	(282)
Total Primary energy kWh/year			4242.9172	(286)
Dwelling Primary energy Rate (DPER)			35.2900	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

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1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor	47.0600 (1b)	x	2.4800 (2b)	=	116.7088	(1b) - (3b)	
First floor	49.7800 (1c)	x	2.7800 (2c)	=	138.3884	(1c) - (3c)	
Second floor	23.4000 (1d)	x	2.7700 (2d)	=	64.8180	(1d) - (3d)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	120.2400					(4)	
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	319.9152	(5)	

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	4 * 10 =	40.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1250	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	

Measured/design AP50	5.0000	(17)
Infiltration rate	0.3750	(18)
Number of sides sheltered	2	(19)
Shelter factor (20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) =	0.3188	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4064	0.3985	0.3905	0.3507	0.3427	0.3028	0.3028	0.2949	0.3188	0.3427	0.3586	0.3746	(22b)
Effective ac	0.5826	0.5794	0.5762	0.5615	0.5587	0.5459	0.5459	0.5435	0.5508	0.5587	0.5643	0.5701	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			4.1400	1.0000	4.1400			(26)
TER Opening Type			9.3900	1.1450	10.7519			(27)
GF			47.0600	0.1300	6.1178			(28a)
Exposed Floor			2.7200	0.1300	0.3536			(28b)
Main	129.1100	13.5300	115.5800	0.1800	20.8044			(29a)
Dwarf Wall (PIRx0.72)	16.7700		16.7700	0.1800	3.0186			(29a)
PIJ	15.5100		15.5100	0.1100	1.7061			(30)
PIR	17.5400		17.5400	0.1100	1.9294			(30)
Residual Ceiling	26.3800		26.3800	0.1100	2.9018			(30)
Total net area of external elements Aum(A, m2)			255.0900					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		51.7236			(33)
Main dwelling								
Party Wall 1			47.6000	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 77.1945 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	9.3200	0.0500	0.4660
E3 Sill	9.3200	0.0500	0.4660
E4 Jamb	30.6000	0.0500	1.5300
E5 Ground floor (normal)	20.0500	0.1600	3.2080
E11 Eaves (insulation at rafter level)	18.1000	0.0400	0.7240
E16 Corner (normal)	24.0800	0.0900	2.1672
E12 Gable (insulation at ceiling level)	5.6600	0.0600	0.3396
E6 Intermediate floor within a dwelling	39.5500	0.0000	0.0000
E17 Corner (inverted - internal area greater than external area)	2.4800	-0.0900	-0.2232
P1 Party wall - Ground floor	9.0500	0.0800	0.7240
E20 Exposed floor (normal)	3.3800	0.3200	1.0816
E21 Exposed floor (inverted)	3.3800	0.3200	1.0816
E13 Gable (insulation at rafter level)	8.2800	0.0800	0.6624
E18 Party wall between dwellings	10.5200	0.0600	0.6312
R6 Flat ceiling	18.1000	0.0600	1.0860

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	13.9444	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	65.6680	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	61.5060	61.1674	60.8355	59.2766	58.9849	57.6271	57.6271	57.3757	58.1501	58.9849	59.5749	60.1918	(38)
Heat transfer coeff	127.1740	126.8354	126.5035	124.9446	124.6529	123.2951	123.2951	123.0437	123.8181	124.6529	125.2429	125.8598	(39)
Average = Sum(39)m / 12 =												124.9432	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0577	1.0549	1.0521	1.0391	1.0367	1.0254	1.0254	1.0233	1.0298	1.0367	1.0416	1.0467	(40)
HLP (average)												1.0391	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.8642	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	72.2437	71.1580	69.5759	66.5490	64.3151	61.8240	60.4080	61.9781	63.6992	66.3739	69.4659	71.9669	(42a)
Hot water usage for baths	31.1904	30.7271	30.0748	28.8721	27.9715	26.9729	26.4334	27.0812	27.7865	28.8550	30.0826	31.0849	(42b)
Hot water usage for other uses	43.9627	42.3640	40.7654	39.1667	37.5681	35.9694	35.9694	37.5681	39.1667	40.7654	42.3640	43.9627	(42c)
Average daily hot water use (litres/day)												135.4907	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	147.3967	144.2491	140.4161	134.5878	129.8547	124.7663	122.8109	126.6274	130.6524	135.9943	141.9125	147.0144	(44)
Energy conte	233.4403	205.4088	215.8143	184.2439	174.8094	153.4147	148.5292	156.7911	161.1075	184.5430	202.1803	230.1891	(45)
Energy content (annual)										Total = Sum(45)m =		2250.4717	
Distribution loss (46)m = 0.15 x (45)m	35.0160	30.8113	32.3722	27.6366	26.2214	23.0122	22.2794	23.5187	24.1661	27.6815	30.3271	34.5284	(46)

Water storage loss:		
Store volume	210.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):	1.7016	(48)
Temperature factor from Table 2b	0.5400	(49)
Enter (49) or (54) in (55)	0.9188	(55)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Total storage loss	28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842	(56)
If cylinder contains dedicated solar storage	28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	285.1869	252.1477	267.5609	234.3213	226.5560	203.4920	200.2757	208.5377	211.1848	236.2896	252.2577	281.9357	(62)
WWHRS	-33.0268	-29.2092	-30.5861	-25.3265	-23.6034	-20.1976	-18.9320	-20.1323	-20.8972	-24.6355	-27.9091	-32.4152	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	252.1601	222.9385	236.9748	208.9947	202.9525	183.2944	181.3437	188.4054	190.2876	211.6541	224.3486	249.5205	(64)

Total per year (kWh/year) = Sum(64)m = 2552.8750 (64)

12Total per year (kWh/year) 2553 (64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

119.0162	105.6895	113.1555	101.3230	99.5214	91.0723	90.7832	93.5303	93.6301	102.7578	107.2868	117.9351	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

174.6158	193.3247	174.6158	180.4363	174.6158	180.4363	174.6158	174.6158	180.4363	174.6158	180.4363	174.6158	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

285.5253	288.4881	281.0218	265.1269	245.0625	226.2048	213.6066	210.6438	218.1101	234.0050	254.0694	272.9272	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	(69)

Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	(71)

Water heating gains (Table 5)

159.9680	157.2761	152.0908	140.7264	133.7653	126.4893	122.0205	125.7128	130.0418	138.1154	149.0095	158.5150	(72)

Total internal gains

689.0726	708.0524	676.6920	655.2532	622.4072	599.0939	576.2064	576.9359	594.5518	615.6997	652.4788	675.0215	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	5.8000	19.6403	0.6300	0.7000	0.7700	34.8135	(76)
South	0.7800	46.7521	0.6300	0.7000	0.7700	11.1447	(78)
West	2.8100	19.6403	0.6300	0.7000	0.7700	16.8665	(80)

Solar gains	62.8246	119.3491	189.7423	269.0966	324.9668	330.9824	315.7680	274.1278	217.9248	139.6467	77.6491	52.1291	(83)
Total gains	751.8973	827.4015	866.4343	924.3498	947.3739	930.0763	891.9745	851.0637	812.4766	755.3464	730.1279	727.1506	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	20.2738	20.3279	20.3812	20.6355	20.6838	20.9116	20.9116	20.9543	20.8233	20.6838	20.5864	20.4855	
alpha	2.3516	2.3552	2.3587	2.3757	2.3789	2.3941	2.3941	2.3970	2.3882	2.3789	2.3724	2.3657	
util living area													
	0.9420	0.9256	0.9022	0.8509	0.7713	0.6455	0.5193	0.5533	0.7224	0.8624	0.9219	0.9460	(86)
MIT	18.1105	18.3918	18.8463	19.5080	20.1174	20.6095	20.8359	20.8030	20.4476	19.6717	18.8057	18.0746	(87)
Th 2	20.0356	20.0379	20.0401	20.0509	20.0529	20.0622	20.0622	20.0639	20.0586	20.0529	20.0488	20.0446	(88)
util rest of house													
	0.9351	0.9167	0.8898	0.8306	0.7365	0.5855	0.4320	0.4683	0.6702	0.8397	0.9112	0.9396	(89)
MIT 2	16.6355	16.9918	17.5672	18.3998	19.1453	19.7201	19.9519	19.9251	19.5464	18.6152	17.5266	16.5949	(90)
Living area fraction									fLA = Living area / (4) =			0.2917	(91)
MIT	17.0658	17.4002	17.9404	18.7231	19.4289	19.9796	20.2098	20.1812	19.8093	18.9234	17.8998	17.0266	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.0658	17.4002	17.9404	18.7231	19.4289	19.9796	20.2098	20.1812	19.8093	18.9234	17.8998	17.0266	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9049	0.8835	0.8543	0.7956	0.7099	0.5797	0.4467	0.4798	0.6544	0.8057	0.8782	0.9106	(94)
Useful gains	680.4244	731.0085	740.2288	735.4573	672.5797	539.1931	398.4571	408.3412	531.7080	608.5915	641.1902	662.1466	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1623.4794	1585.4708	1447.2461	1227.3451	963.4317	663.2744	445.0757	465.2531	706.9170	1037.5375	1352.5970	1614.3529	(97)
Space heating kWh													
	701.6329	574.1987	526.0209	354.1592	216.3939	0.0000	0.0000	0.0000	0.0000	319.1358	512.2129	708.4415	(98a)

Space heating requirement - total per year (kWh/year) 3912.1958

Solar heating kWh

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)

Solar heating contribution - total per year (kWh/year) 0.0000

Space heating kWh

701.6329	574.1987	526.0209	354.1592	216.3939	0.0000	0.0000	0.0000	0.0000	319.1358	512.2129	708.4415	(98c)

Space heating requirement after solar contribution - total per year (kWh/year) 3912.1958

Space heating per m2 (98c) / (4) = 32.5366 (99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (201)

Fraction of space heat from main system(s) 1.0000 (202)

Efficiency of main space heating system 1 (in %) 92.3000 (206)

Efficiency of main space heating system 2 (in %) 0.0000 (207)

Efficiency of secondary/supplementary heating system, % 0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	701.6329	574.1987	526.0209	354.1592	216.3939	0.0000	0.0000	0.0000	0.0000	319.1358	512.2129	708.4415	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	760.1657	622.1004	569.9034	383.7045	234.4463	0.0000	0.0000	0.0000	0.0000	345.7593	554.9435	767.5423	(211)

Space heating efficiency (main heating system 2)												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating												
Water heating requirement												
252.1601	222.9385	236.9748	208.9947	202.9525	183.2944	181.3437	188.4054	190.2876	211.6541	224.3486	249.5205	(64)
Efficiency of water heater												
(217)m												79.8000 (216)
86.2289	86.0847	85.7948	85.2326	84.2039	79.8000	79.8000	79.8000	79.8000	84.9783	85.8508	86.2658	(217)
Fuel for water heating, kWh/month												
292.4310	258.9758	276.2113	245.2052	241.0252	229.6923	227.2477	236.0970	238.4556	249.0683	261.3237	289.2460	(219)
Space cooling fuel requirement												
(221)m												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa												
7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting												
36.2817	29.1065	26.2072	19.2005	14.8310	12.1171	13.5294	17.5860	22.8425	29.9705	33.8517	37.2901	(232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m												
-44.8351	-63.5977	-91.9124	-103.8503	-112.3250	-104.8897	-103.5753	-97.6460	-87.1929	-72.9770	-49.4256	-38.7153	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m												
-24.0700	-50.8073	-101.3344	-152.7222	-202.4756	-203.6983	-201.3212	-170.2092	-124.4164	-72.8467	-32.1932	-19.0216	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	4238.5653	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	3044.9791	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	292.8142	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-2326.0585	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	5336.3003	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	4238.5653	0.2100	890.0987	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3044.9791	0.2100	639.4456	(264)
Space and water heating			1529.5443	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	292.8142	0.1443	42.2621	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-970.9424	0.1345	-130.5801	
PV Unit electricity exported	-1355.1161	0.1258	-170.4601	
Total			-301.0402	(269)
Total CO2, kg/year			1282.6956	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.6700	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	4238.5653	1.1300	4789.5788	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3044.9791	1.1300	3440.8264	(278)
Space and water heating			8230.4053	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	292.8142	1.5338	449.1283	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-970.9424	1.4970	-1453.5394	
PV Unit electricity exported	-1355.1161	0.4617	-625.6980	
Total			-2079.2374	(283)
Total Primary energy kWh/year			6730.3969	(286)
Target Primary Energy Rate (TPER)			55.9700	(287)

Full SAP Calculation Printout

Property Reference	78449-13	**Issued on Date**	03/10/2025
Assessment Reference	001	**Prop Type Ref**	End
Property	830 Rochdale Road, MANCHESTER, M9 8FA		

SAP Rating	84 B	**DER**	3.34	**TER**	10.67
Environmental	97 A	**% DER < TER**			68.70
CO_2 Emissions (t/year)	0.38	**DFEE**	33.38	**TFEE**	37.89
Compliance Check	See BREL	**% DFEE < TFEE**			11.92
% DPER < TPER	36.95	**DPER**	35.29	**TPER**	55.97

Assessor Details	Mr. Daniel Goddard	**Assessor ID**	CP52-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.0600 (1b)	x	2.4800 (2b)	=	116.7088	(1b) - (3b)
First floor	49.7800 (1c)	x	2.7800 (2c)	=	138.3884	(1c) - (3c)
Second floor	23.4000 (1d)	x	2.7700 (2d)	=	64.8180	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	120.2400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	319.9152	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.2500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2125	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2709	0.2656	0.2603	0.2338	0.2284	0.2019	0.2019	0.1966	0.2125	0.2284	0.2391	0.2497	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	80.1000 (23c)

Effective ac	0.3704	0.3651	0.3598	0.3332	0.3279	0.3014	0.3014	0.2961	0.3120	0.3279	0.3386	0.3492	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door			4.1400	1.0000	4.1400			(26)
Window			9.3900	0.7752	7.2791			(27)
GF			47.0600	0.0900	4.2354	75.0000	3529.5000	(28a)
Exposed Floor			2.7200	0.1400	0.3808	20.0000	54.4000	(28b)
Main	129.1100	13.5300	115.5800	0.1300	15.0254	9.0000	1040.2200	(29a)
Dwarf Wall (PIRx0.72)	16.7700		16.7700	0.0900	1.5093	9.0000	150.9300	(29a)
PIJ	15.5100		15.5100	0.1300	2.0163	9.0000	139.5900	(30)
PIR	17.5400		17.5400	0.1300	2.2802	9.0000	157.8600	(30)
Residual Ceiling	26.3800		26.3800	0.0900	2.3742	9.0000	237.4200	(30)
Total net area of external elements Aum(A, m2)			255.0900					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		39.2407			(33)
Main dwelling								
Party Wall 1			47.6000	0.0000	0.0000	20.0000	952.0000	(32)

Timber	124.1700		9.0000	1117.5300 (32c)
FF	47.0600		18.0000	847.0800 (32d)
SF	23.4000		18.0000	421.2000 (32d)
GF	47.0600		9.0000	423.5400 (32e)
FF	23.4000		9.0000	210.6000 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 9281.8700 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 77.1945 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	9.3200	0.1150	1.0718
E3 Sill	9.3200	0.0170	0.1584
E4 Jamb	30.6000	0.0940	2.8764
E5 Ground floor (normal)	20.0500	0.0670	1.3434
E11 Eaves (insulation at rafter level)	18.1000	0.0250	0.4525
E16 Corner (normal)	24.0800	0.0680	1.6374
E12 Gable (insulation at ceiling level)	5.6600	0.0770	0.4358
E6 Intermediate floor within a dwelling	39.5500	0.0320	1.2656
E17 Corner (inverted - internal area greater than external area)	2.4800	-0.0290	-0.0719
P1 Party wall - Ground floor	9.0500	0.3200	2.8960
E20 Exposed floor (normal)	3.3800	0.0790	0.2670
E21 Exposed floor (inverted)	3.3800	0.0630	0.2129
E13 Gable (insulation at rafter level)	8.2800	0.0740	0.6127
E18 Party wall between dwellings	10.5200	0.0920	0.9678
R6 Flat ceiling	18.1000	-0.0430	-0.7783

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 13.3476 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 52.5883 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	39.1078	38.5470	37.9861	35.1819	34.6210	31.8168	31.8168	31.2559	32.9385	34.6210	35.7427	36.8644	(38)
Heat transfer coeff	91.6962	91.1353	90.5745	87.7702	87.2093	84.4051	84.4051	83.8442	85.5268	87.2093	88.3310	89.4527	(39)
Average = Sum(39)m / 12 =												87.6300	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7626	0.7579	0.7533	0.7300	0.7253	0.7020	0.7020	0.6973	0.7113	0.7253	0.7346	0.7440	(40)
HLP (average)												0.7288	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.8642 (42)
Hot water usage for mixer showers

72.2437	71.1580	69.5759	66.5490	64.3151	61.8240	60.4080	61.9781	63.6992	66.3739	69.4659	71.9669	(42a)

Hot water usage for baths

31.1904	30.7271	30.0748	28.8721	27.9715	26.9729	26.4334	27.0812	27.7865	28.8550	30.0826	31.0849	(42b)

Hot water usage for other uses

43.9627	42.3640	40.7654	39.1667	37.5681	35.9694	35.9694	37.5681	39.1667	40.7654	42.3640	43.9627	(42c)

Average daily hot water use (litres/day) 135.4907 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	147.3967	144.2491	140.4161	134.5878	129.8547	124.7663	122.8109	126.6274	130.6524	135.9943	141.9125	147.0144	(44)
Energy conte	233.4403	205.4088	215.8143	184.2439	174.8094	153.4147	148.5292	156.7911	161.1075	184.5430	202.1803	230.1891	(45)
Energy content (annual)										Total = Sum(45)m =		2250.4717	
Distribution loss (46)m = 0.15 x (45)m	35.0160	30.8113	32.3722	27.6366	26.2214	23.0122	22.2794	23.5187	24.1661	27.6815	30.3271	34.5284	(46)
Water storage loss:													
Store volume												210.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5800	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8532	(55)
Total storage loss	26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(56)
If cylinder contains dedicated solar storage	26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	283.1519	250.3096	265.5259	232.3519	224.5210	201.5227	198.2408	206.5027	209.2155	234.2546	250.2883	279.9007	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	283.1519	250.3096	265.5259	232.3519	224.5210	201.5227	198.2408	206.5027	209.2155	234.2546	250.2883	279.9007	(64)
										Total per year (kWh/year) = Sum(64)m =		2835.7857	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	117.3882	104.2191	111.5276	99.7475	97.8934	89.4968	89.1552	91.9023	92.0546	101.1298	105.7114	116.3071	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	43.0265	38.2157	31.0791	23.5289	17.5881	14.8486	16.0445	20.8552	27.9918	35.5420	41.4828	44.2223	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	426.1571	430.5793	419.4356	395.7119	365.7649	337.6190	318.8159	314.3937	325.5374	349.2611	379.2081	407.3540	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	(71)
Water heating gains (Table 5)	157.7798	155.0879	149.9026	138.5382	131.5771	124.3011	119.8323	123.5246	127.8537	135.9272	146.8213	156.3268	(72)
Total internal gains	739.2978	736.2173	712.7517	670.1133	627.2646	589.1032	567.0270	571.1079	593.7173	633.0648	679.8466	720.2375	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	5.8000	19.6403	0.3000	0.0000	0.7700	26.3140	(76)
South	0.7800	46.7521	0.3000	0.0000	0.7700	8.4238	(78)
West	2.8100	19.6403	0.3000	0.0000	0.7700	12.7487	(80)

Solar gains	47.4865	90.2110	143.4182	203.3988	245.6287	250.1756	238.6758	207.2016	164.7202	105.5531	58.6917	39.4022	(83)
Total gains	786.7843	826.4283	856.1699	873.5122	872.8933	839.2788	805.7028	778.3096	758.4375	738.6178	738.5383	759.6397	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	28.1178	28.2909	28.4661	29.3755	29.5645	30.5467	30.5467	30.7510	30.1461	29.5645	29.1890	28.8230	
alpha	2.8745	2.8861	2.8977	2.9584	2.9710	3.0364	3.0364	3.0501	3.0097	2.9710	2.9459	2.9215	
util living area	0.9224	0.9067	0.8758	0.8151	0.7201	0.5712	0.4362	0.4644	0.6502	0.8191	0.8970	0.9276	(86)
Living	19.1248	19.3250	19.6825	20.1725	20.5675	20.8543	20.9522	20.9417	20.7685	20.2844	19.6663	19.1255	
Non living	18.5494	18.7485	19.1012	19.5898	19.9643	20.2353	20.3117	20.3086	20.1582	19.7052	19.1009	18.5618	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.0407	19.3250	19.6825	20.1725	20.5675	20.8543	20.9522	20.9417	20.7685	20.2844	19.6663	19.3877	(87)
Th 2	20.2859	20.2899	20.2940	20.3144	20.3185	20.3391	20.3391	20.3432	20.3309	20.3185	20.3103	20.3022	(88)
util rest of house	0.9149	0.8976	0.8634	0.7961	0.6898	0.5256	0.3775	0.4063	0.6072	0.7971	0.8858	0.9207	(89)
MIT 2	19.3975	18.7485	19.1012	19.5898	19.9643	20.2353	20.3117	20.3086	20.1582	19.7052	19.1009	18.8053	(90)
Living area fraction									fLA = Living area / (4) =			0.2917	(91)
MIT	19.5852	18.9167	19.2708	19.7598	20.1403	20.4159	20.4986	20.4933	20.3363	19.8742	19.2659	18.9752	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5852	18.9167	19.2708	19.7598	20.1403	20.4159	20.4986	20.4933	20.3363	19.8742	19.2659	18.9752	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9066	0.8769	0.8426	0.7790	0.6813	0.5311	0.3920	0.4199	0.6076	0.7810	0.8659	0.9048	(94)
Useful gains	713.3039	724.6710	721.4406	680.4617	594.7186	445.7225	315.8707	326.8149	460.8266	576.8965	639.4755	687.3434	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1401.5931	1277.4163	1156.7102	953.1686	736.0689	490.8906	329.0618	343.1990	533.3689	808.7970	1074.6225	1321.6825	(97)
Space heating kWh	512.0872	371.4448	323.8406	196.3490	105.1647	0.0000	0.0000	0.0000	0.0000	172.5340	313.3058	471.9483	(98a)
Space heating requirement - total per year (kWh/year)												2466.6743	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	512.0872	371.4448	323.8406	196.3490	105.1647	0.0000	0.0000	0.0000	0.0000	172.5340	313.3058	471.9483	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2466.6743	
Space heating per m2											(98c) / (4) =	20.5146	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	280.7591	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	512.0872	371.4448	323.8406	196.3490	105.1647	0.0000	0.0000	0.0000	0.0000	172.5340	313.3058	471.9483	(98)
Space heating efficiency (main heating system 1)	280.7591	280.7591	280.7591	280.7591	280.7591	0.0000	0.0000	0.0000	0.0000	280.7591	280.7591	280.7591	(210)
Space heating fuel (main heating system)	182.3938	132.3002	115.3447	69.9350	37.4573	0.0000	0.0000	0.0000	0.0000	61.4527	111.5924	168.0973	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	283.1519	250.3096	265.5259	232.3519	224.5210	201.5227	198.2408	206.5027	209.2155	234.2546	250.2883	279.9007	(64)
Efficiency of water heater												279.7171	(216)
(217)m	279.7171	279.7171	279.7171	279.7171	279.7171	279.7171	279.7171	279.7171	279.7171	279.7171	279.7171	279.7171	(217)
Fuel for water heating, kWh/month	101.2280	89.4867	94.9266	83.0668	80.2672	72.0452	70.8719	73.8256	74.7954	83.7470	89.4791	100.0656	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	45.0156	40.6593	45.0156	43.5635	45.0156	43.5635	45.0156	45.0156	43.5635	45.0156	43.5635	45.0156	(231)
Lighting	37.6608	30.2129	27.2034	19.9304	15.3948	12.5777	14.0436	18.2544	23.7107	31.1097	35.1384	38.7075	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)

Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	878.5733	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	279.7171	
Water heating fuel used	1013.8051	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.3580)		
mechanical ventilation fans (SFP = 1.3580)	530.0227	(230a)
Total electricity for the above, kWh/year	530.0227	(231)
Electricity for lighting (calculated in Appendix L)	303.9443	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2726.3454	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	878.5733	16.4900	144.8767	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1013.8051	16.4900	167.1765	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	530.0227	16.4900	87.4007	(249)
Energy for lighting	303.9443	16.4900	50.1204	(250)
Additional standing charges			0.0000	(251)
Total energy cost			449.5744	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.9795	(257)
SAP value		84.1229	
SAP rating (Section 12)		84	(258)
SAP band		B	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	878.5733	0.1549	136.0989	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1013.8051	0.1410	142.9330	(264)
Space and water heating			279.0319	(265)
Pumps, fans and electric keep-hot	530.0227	0.1387	73.5207	(267)
Energy for lighting	303.9443	0.1443	43.8686	(268)
Total CO2, kg/year			396.4211	(272)
CO2 emissions per m2			3.3000	(273)
EI value			96.7853	
EI rating			97	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.0600	(1b) x	2.4800	(2b) =	116.7088	(1b) - (3b)
First floor	49.7800	(1c) x	2.7800	(2c) =	138.3884	(1c) - (3c)
Second floor	23.4000	(1d) x	2.7700	(2d) =	64.8180	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	120.2400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		319.9152	(5)

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2. Ventilation rate

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m3 per hour

Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.2500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2125	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.6000	4.5000	4.5000	4.1000	4.2000	3.7000	3.5000	3.5000	3.7000	4.1000	4.1000	4.2000	(22)
Wind factor	1.1500	1.1250	1.1250	1.0250	1.0500	0.9250	0.8750	0.8750	0.9250	1.0250	1.0250	1.0500	(22a)
Adj infilt rate	0.2444	0.2391	0.2391	0.2178	0.2231	0.1966	0.1859	0.1859	0.1966	0.2178	0.2178	0.2231	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =		80.1000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.3439	0.3386	0.3386	0.3173	0.3226	0.2961	0.2854	0.2854	0.2961	0.3173	0.3173	0.3226	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door			4.1400	1.0000	4.1400			(26)
Window			9.3900	0.7752	7.2791			(27)
GF			47.0600	0.0900	4.2354	75.0000	3529.5000	(28a)
Exposed Floor			2.7200	0.1400	0.3808	20.0000	54.4000	(28b)
Main	129.1100	13.5300	115.5800	0.1300	15.0254	9.0000	1040.2200	(29a)
Dwarf Wall (PIRx0.72)	16.7700		16.7700	0.0900	1.5093	9.0000	150.9300	(29a)
PIJ	15.5100		15.5100	0.1300	2.0163	9.0000	139.5900	(30)
PIR	17.5400		17.5400	0.1300	2.2802	9.0000	157.8600	(30)
Residual Ceiling	26.3800		26.3800	0.0900	2.3742	9.0000	237.4200	(30)
Total net area of external elements Aum(A, m2)			255.0900					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		39.2407			(33)
Main dwelling								
Party Wall 1			47.6000	0.0000	0.0000	20.0000	952.0000	(32)
Timber			124.1700			9.0000	1117.5300	(32c)
FF			47.0600			18.0000	847.0800	(32d)
SF			23.4000			18.0000	421.2000	(32d)
GF			47.0600			9.0000	423.5400	(32e)
FF			23.4000			9.0000	210.6000	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	9281.8700 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		77.1945 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	9.3200	0.1150	1.0718
E3 Sill	9.3200	0.0170	0.1584
E4 Jamb	30.6000	0.0940	2.8764
E5 Ground floor (normal)	20.0500	0.0670	1.3434
E11 Eaves (insulation at rafter level)	18.1000	0.0250	0.4525
E16 Corner (normal)	24.0800	0.0680	1.6374
E12 Gable (insulation at ceiling level)	5.6600	0.0770	0.4358
E6 Intermediate floor within a dwelling	39.5500	0.0320	1.2656
E17 Corner (inverted - internal area greater than external area)	2.4800	-0.0290	-0.0719
P1 Party wall - Ground floor	9.0500	0.3200	2.8960
E20 Exposed floor (normal)	3.3800	0.0790	0.2670
E21 Exposed floor (inverted)	3.3800	0.0630	0.2129
E13 Gable (insulation at rafter level)	8.2800	0.0740	0.6127
E18 Party wall between dwellings	10.5200	0.0920	0.9678
R6 Flat ceiling	18.1000	-0.0430	-0.7783

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		13.3476 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	52.5883 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	36.3036	35.7427	35.7427	33.4993	34.0602	31.2559	30.1342	30.1342	31.2559	33.4993	33.4993	34.0602	(38)
Heat transfer coeff	88.8919	88.3310	88.3310	86.0876	86.6485	83.8442	82.7225	82.7225	83.8442	86.0876	86.0876	86.6485	(39)
Average = Sum(39)m / 12 =												85.8540	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7393	0.7346	0.7346	0.7160	0.7206	0.6973	0.6880	0.6880	0.6973	0.7160	0.7160	0.7206	(40)
HLP (average)												0.7140	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.8642 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
72.2437	71.1580	69.5759	66.5490	64.3151	61.8240	60.4080	61.9781	63.6992	66.3739	69.4659	71.9669	(42a)

Hot water usage for baths

31.1904	30.7271	30.0748	28.8721	27.9715	26.9729	26.4334	27.0812	27.7865	28.8550	30.0826	31.0849	(42b)

Hot water usage for other uses

43.9627	42.3640	40.7654	39.1667	37.5681	35.9694	35.9694	37.5681	39.1667	40.7654	42.3640	43.9627	(42c)

Average daily hot water use (litres/day)	135.4907 (43)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Daily hot water use

	147.3967	144.2491	140.4161	134.5878	129.8547	124.7663	122.8109	126.6274	130.6524	135.9943	141.9125	147.0144	(44)
Energy conte	233.4403	205.4088	215.8143	184.2439	174.8094	153.4147	148.5292	156.7911	161.1075	184.5430	202.1803	230.1891	(45)
Energy content (annual)										Total = Sum(45)m =		2250.4717	

Distribution loss (46)m = 0.15 x (45)m

	35.0160	30.8113	32.3722	27.6366	26.2214	23.0122	22.2794	23.5187	24.1661	27.6815	30.3271	34.5284	(46)

Water storage loss:

Store volume												210.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5800	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8532	(55)

Total storage loss

	26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(56)

If cylinder contains dedicated solar storage

	26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

	283.1519	250.3096	265.5259	232.3519	224.5210	201.5227	198.2408	206.5027	209.2155	234.2546	250.2883	279.9007	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

	283.1519	250.3096	265.5259	232.3519	224.5210	201.5227	198.2408	206.5027	209.2155	234.2546	250.2883	279.9007	(64)
										Total per year (kWh/year) = Sum(64)m =		2835.7857	(64)

Electric shower(s)

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)

Heat gains from water heating, kWh/month

	117.3882	104.2191	111.5276	99.7475	97.8934	89.4968	89.1552	91.9023	92.0546	101.1298	105.7114	116.3071	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	43.0265	38.2157	31.0791	23.5289	17.5881	14.8486	16.0445	20.8552	27.9918	35.5420	41.4828	44.2223	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	426.1571	430.5793	419.4356	395.7119	365.7649	337.6190	318.8159	314.3937	325.5374	349.2611	379.2081	407.3540	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	(71)

Water heating gains (Table 5)

	157.7798	155.0879	149.9026	138.5382	131.5771	124.3011	119.8323	123.5246	127.8537	135.9272	146.8213	156.3268	(72)

Total internal gains

	739.2978	736.2173	712.7517	670.1133	627.2646	589.1032	567.0270	571.1079	593.7173	633.0648	679.8466	720.2375	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	5.8000	16.6187	0.3000	0.0000	0.7700	22.2657	(76)
South	0.7800	39.5594	0.3000	0.0000	0.7700	7.1278	(78)
West	2.8100	16.6187	0.3000	0.0000	0.7700	10.7874	(80)

Solar gains	40.1809	80.1875	134.4546	193.9069	228.9976	237.6668	222.2589	190.0448	156.1261	97.5566	51.5775	35.6496	(83)
Total gains	779.4787	816.4049	847.2063	864.0202	856.2622	826.7700	789.2859	761.1527	749.8434	730.6214	731.4242	755.8871	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	29.0049	29.1890	29.1890	29.9497	29.7558	30.7510	31.1680	31.1680	30.7510	29.9497	29.9497	29.7558	
alpha	2.9337	2.9459	2.9459	2.9966	2.9837	3.0501	3.0779	3.0779	3.0501	2.9966	2.9966	2.9837	
util living area	0.9179	0.9015	0.8720	0.8040	0.6995	0.5480	0.4372	0.4598	0.6486	0.8140	0.8902	0.9226	(86)
Living	19.2735	19.4646	19.7630	20.2560	20.6321	20.8800	20.9544	20.9463	20.7786	20.3254	19.7834	19.2811	
Non living	18.7104	18.9004	19.1917	19.6793	20.0270	20.2602	20.3252	20.3199	20.1778	19.7507	19.2274	18.7298	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.1168	19.4646	19.7630	20.2560	20.6321	20.8800	20.9544	20.9463	20.7786	20.3254	19.7834	19.5216	(87)
Th 2	20.3063	20.3103	20.3103	20.3268	20.3226	20.3432	20.3515	20.3515	20.3432	20.3268	20.3268	20.3226	(88)
util rest of house	0.9099	0.8920	0.8593	0.7839	0.6665	0.5001	0.3794	0.4014	0.6062	0.7913	0.8783	0.9151	(89)
MIT 2	19.4899	18.9004	19.1917	19.6793	20.0270	20.2602	20.3252	20.3199	20.1778	19.7507	19.2274	18.9526	(90)
Living area fraction										fLA = Living area / (4) =		0.2917	(91)
MIT	19.6728	19.0650	19.3584	19.8476	20.2035	20.4410	20.5088	20.5027	20.3531	19.9184	19.3896	19.1186	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6728	19.0650	19.3584	19.8476	20.2035	20.4410	20.5088	20.5027	20.3531	19.9184	19.3896	19.1186	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9018	0.8717	0.8392	0.7681	0.6603	0.5075	0.3937	0.4154	0.6069	0.7760	0.8589	0.8995	(94)
Useful gains	702.9267	711.6899	710.9809	663.6459	565.3718	419.5569	310.7691	316.1764	455.0911	566.9752	628.2214	679.9082	(95)
Ext temp.	4.7000	5.3000	6.7000	9.3000	12.3000	15.0000	16.6000	16.5000	14.1000	10.8000	7.5000	4.6000	(96)
Heat loss rate W	1330.9576	1215.8752	1118.1256	908.0158	684.8272	456.1978	323.3417	331.1111	524.2836	784.9793	1023.5460	1258.0160	(97)

Space heating kWh													
	467.2550	338.8126	302.9157	175.9464	88.8748	0.0000	0.0000	0.0000	0.0000	162.1951	284.6337	430.1122	(98a)
Space heating requirement - total per year (kWh/year)												2250.7454	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	467.2550	338.8126	302.9157	175.9464	88.8748	0.0000	0.0000	0.0000	0.0000	162.1951	284.6337	430.1122	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2250.7454	
Space heating per m2											(98c) / (4) =	18.7188	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												279.8754	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	467.2550	338.8126	302.9157	175.9464	88.8748	0.0000	0.0000	0.0000	0.0000	162.1951	284.6337	430.1122	(98)
Space heating efficiency (main heating system 1)													
	279.8754	279.8754	279.8754	279.8754	279.8754	0.0000	0.0000	0.0000	0.0000	279.8754	279.8754	279.8754	(210)
Space heating fuel (main heating system)													
	166.9511	121.0584	108.2323	62.8660	31.7551	0.0000	0.0000	0.0000	0.0000	57.9526	101.7001	153.6799	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	283.1519	250.3096	265.5259	232.3519	224.5210	201.5227	198.2408	206.5027	209.2155	234.2546	250.2883	279.9007	(64)
Efficiency of water heater												279.7257	(216)
(217)m	279.7257	279.7257	279.7257	279.7257	279.7257	279.7257	279.7257	279.7257	279.7257	279.7257	279.7257	279.7257	(217)
Fuel for water heating, kWh/month													
	101.2248	89.4840	94.9237	83.0642	80.2647	72.0430	70.8697	73.8233	74.7931	83.7444	89.4764	100.0626	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	45.0156	40.6593	45.0156	43.5635	45.0156	43.5635	45.0156	45.0156	43.5635	45.0156	43.5635	45.0156	(231)
Lighting	37.6608	30.2129	27.2034	19.9304	15.3948	12.5777	14.0436	18.2544	23.7107	31.1097	35.1384	38.7075	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												804.1956	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												279.7257	
Water heating fuel used												1013.7738	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.3580)													
mechanical ventilation fans (SFP = 1.3580)												530.0227	(230a)
Total electricity for the above, kWh/year												530.0227	(231)
Electricity for lighting (calculated in Appendix L)												303.9443	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												2651.9364	(238)

10a. Fuel costs - using BEDF prices (583)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	804.1956	28.4300	228.6328	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1013.7738	28.4300	288.2159	(247)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(247a)
Pumps, fans and electric keep-hot	530.0227	28.4300	150.6855	(249)
Energy for lighting	303.9443	28.4300	86.4114	(250)
Additional standing charges			0.0000	(251)
Total energy cost			753.9455	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	804.1956	0.1550	124.6115	(261)

Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1013.7738	0.1410	142.9286 (264)
Space and water heating			267.5401 (265)
Pumps, fans and electric keep-hot	530.0227	0.1387	73.5207 (267)
Energy for lighting	303.9443	0.1443	43.8686 (268)
Total CO2, kg/year			384.9293 (272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	804.1956	1.5737	1265.5269 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1013.7738	1.5213	1542.2762 (278)
Space and water heating			2807.8031 (279)
Pumps, fans and electric keep-hot	530.0227	1.5128	801.8183 (281)
Energy for lighting	303.9443	1.5338	466.1999 (282)
Total Primary energy kWh/year			4075.8214 (286)

SAP 10 EPC IMPROVEMENTS

001

Current energy efficiency rating: B 84
Current environmental impact rating: A 97

N Solar water heating		Recommended
U Solar photovoltaic panels		Recommended
V2 Wind turbine		Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
N Solar water heating	+ 1.2	-£ 54	-23 kg (6.0%)
U Solar photovoltaic panels	+ 6.9	-£ 289	-207 kg (57.2%)

	Typical annual savings		Energy efficiency	Environmental impact
Recommended measures				
Solar water heating	£54	0.19 kg/m²	B 85	A 97
Solar photovoltaic panels	£289	1.72 kg/m²	A 92	A 99
Total Savings	£342	1.91 kg/m²		

Potential energy efficiency rating: A 92
Potential environmental impact rating: A 99

Fuel prices for cost data on this page from database revision number 583 TEST (01 Oct 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, West Pennines (England)):

	Current	Potential	Saving
Electricity	£754	£700	£54
Space heating	£379	£405	-£26
Water heating	£288	£209	£79
Lighting	£86	£86	£0
Generated (PV)	-£0	-£289	£289
Total cost of fuels	£754	£411	£343
Total cost of uses	£753	£411	£342
Delivered energy	22 kWh/m²	7 kWh/m²	15 kWh/m²
Carbon dioxide emissions	0.4 tonnes	0.2 tonnes	0.2 tonnes
CO2 emissions per m²	3 kg/m²	1 kg/m²	2 kg/m²
Primary energy	34 kWh/m²	18 kWh/m²	16 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

1. Overall dwelling characteristics

Main dwelling	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	47.0600 (1b)	x	2.4800 (2b)	=	116.7088 (1b) - (3b)	
First floor	49.7800 (1c)	x	2.7800 (2c)	=	138.3884 (1c) - (3c)	
Second floor	23.4000 (1d)	x	2.7700 (2d)	=	64.8180 (1d) - (3d)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	120.2400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	319.9152	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)

Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.2500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2125	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2709	0.2656	0.2603	0.2338	0.2284	0.2019	0.2019	0.1966	0.2125	0.2284	0.2391	0.2497	(22b)

Balanced mechanical ventilation with heat recovery		
If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =		80.1000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.3704	0.3651	0.3598	0.3332	0.3279	0.3014	0.3014	0.2961	0.3120	0.3279	0.3386	0.3492	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Door			4.1400	1.0000	4.1400			(26)
Window			9.3900	0.7752	7.2791			(27)
GF			47.0600	0.0900	4.2354	75.0000	3529.5000	(28a)
Exposed Floor			2.7200	0.1400	0.3808	20.0000	54.4000	(28b)
Main	129.1100	13.5300	115.5800	0.1300	15.0254	9.0000	1040.2200	(29a)
Dwarf Wall (PIRx0.72)	16.7700		16.7700	0.0900	1.5093	9.0000	150.9300	(29a)
PIJ	15.5100		15.5100	0.1300	2.0163	9.0000	139.5900	(30)
PIR	17.5400		17.5400	0.1300	2.2802	9.0000	157.8600	(30)
Residual Ceiling	26.3800		26.3800	0.0900	2.3742	9.0000	237.4200	(30)
Total net area of external elements Aum(A, m2)			255.0900					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		39.2407			(33)
Main dwelling								
Party Wall 1			47.6000	0.0000	0.0000	20.0000	952.0000	(32)
Timber			124.1700			9.0000	1117.5300	(32c)
FF			47.0600			18.0000	847.0800	(32d)
SF			23.4000			18.0000	421.2000	(32d)
GF			47.0600			9.0000	423.5400	(32e)
FF			23.4000			9.0000	210.6000	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	9281.8700 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		77.1945 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	9.3200	0.1150	1.0718
E3 Sill	9.3200	0.0170	0.1584
E4 Jamb	30.6000	0.0940	2.8764
E5 Ground floor (normal)	20.0500	0.0670	1.3434
E11 Eaves (insulation at rafter level)	18.1000	0.0250	0.4525
E16 Corner (normal)	24.0800	0.0680	1.6374
E12 Gable (insulation at ceiling level)	5.6600	0.0770	0.4358
E6 Intermediate floor within a dwelling	39.5500	0.0320	1.2656
E17 Corner (inverted - internal area greater than external area)	2.4800	-0.0290	-0.0719
P1 Party wall - Ground floor	9.0500	0.3200	2.8960
E20 Exposed floor (normal)	3.3800	0.0790	0.2670
E21 Exposed floor (inverted)	3.3800	0.0630	0.2129
E13 Gable (insulation at rafter level)	8.2800	0.0740	0.6127
E18 Party wall between dwellings	10.5200	0.0920	0.9678
R6 Flat ceiling	18.1000	-0.0430	-0.7783

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		13.3476 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	52.5883 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	39.1078	38.5470	37.9861	35.1819	34.6210	31.8168	31.8168	31.2559	32.9385	34.6210	35.7427	36.8644	(38)
Heat transfer coeff	91.6962	91.1353	90.5745	87.7702	87.2093	84.4051	84.4051	83.8442	85.5268	87.2093	88.3310	89.4527	(39)
Average = Sum(39)m / 12 =												87.6300	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7626	0.7579	0.7533	0.7300	0.7253	0.7020	0.7020	0.6973	0.7113	0.7253	0.7346	0.7440	(40)
HLP (average)												0.7288	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.8642 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
72.2437	71.1580	69.5759	66.5490	64.3151	61.8240	60.4080	61.9781	63.6992	66.3739	69.4659	71.9669	(42a)

Hot water usage for baths

31.1904	30.7271	30.0748	28.8721	27.9715	26.9729	26.4334	27.0812	27.7865	28.8550	30.0826	31.0849	(42b)

Hot water usage for other uses

43.9627	42.3640	40.7654	39.1667	37.5681	35.9694	35.9694	37.5681	39.1667	40.7654	42.3640	43.9627	(42c)

Average daily hot water use (litres/day)	135.4907 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	147.3967	144.2491	140.4161	134.5878	129.8547	124.7663	122.8109	126.6274	130.6524	135.9943	141.9125	147.0144	(44)
Energy conte	233.4403	205.4088	215.8143	184.2439	174.8094	153.4147	148.5292	156.7911	161.1075	184.5430	202.1803	230.1891	(45)
Energy content (annual)										Total = Sum(45)m =		2250.4717	

Distribution loss (46)m = 0.15 x (45)m

	35.0160	30.8113	32.3722	27.6366	26.2214	23.0122	22.2794	23.5187	24.1661	27.6815	30.3271	34.5284 (46)

Water storage loss:

Store volume	210.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):	1.5800 (48)
Temperature factor from Table 2b	0.5400 (49)
Enter (49) or (54) in (55)	0.8532 (55)

Total storage loss

	26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492 (56)

If cylinder contains dedicated solar storage

	17.0031	15.3576	17.0031	16.4546	17.0031	16.4546	17.0031	17.0031	16.4546	17.0031	16.4546	17.0031 (57)
Primary loss	23.2624	21.0112	21.8667	15.7584	10.4681	9.9053	10.2355	11.1660	17.1091	21.8667	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)

Total heat required for water heating calculated for each month

	273.7058	241.7776	254.6841	216.4569	202.2805	179.7746	175.7677	184.9602	194.6712	223.4127	241.1469	270.4545 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)

Aperture area of solar collector	3.0000 (H1)
Zero-loss collector efficiency	0.8000 (H2)
Collector linear heat loss coefficient	1.8000 (H3)
Collector 2nd order heat loss coefficient	0.0000 (H4)
Collector loop efficiency	0.9000 (H5)
Incidence angle modifier	1.0000 (H6)
Overshading factor	0.8000 (H8)
Overall heat loss coefficient of system	6.5000 (H10)
Heat loss coefficient of collector loop	3.9667 (H11)
Dedicated solar storage volume	75.0000 (H12)
If combined cylinder, total volume of cylinder	210.0000 (H13)
Effective solar volume	115.5000 (H14)
Reference volume	225.0000 (H15)
Storage tank correction coefficient	1.1814 (H16)
Heat delivered to hot water	661.7243 (H24)
Heat delivered to space heating	0.0000 (H29)
Solar input	661.7243

Solar input	-0.0000	-20.2144	-62.8139	-84.6635	-109.0628	-100.4582	-99.7212	-87.9174	-62.1691	-33.3828	-1.3210	-0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)

Output from w/h

	273.7058	221.5632	191.8702	131.7934	93.2177	79.3164	76.0465	97.0428	132.5020	190.0299	239.8259	270.4545 (64)

Total per year (kWh/year) = Sum(64)m = 1997.3683 (64)

Electric shower(s)

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

	109.8313	97.3935	102.8540	87.0315	80.1010	72.0983	71.1768	74.6683	80.4192	92.4563	98.3982	108.7502 (65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	43.0265	38.2157	31.0791	23.5289	17.5881	14.8486	16.0445	20.8552	27.9918	35.5420	41.4828	44.2223 (67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	426.1571	430.5793	419.4356	395.7119	365.7649	337.6190	318.8159	314.3937	325.5374	349.2611	379.2081	407.3540 (68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)

Losses e.g. evaporation (negative values) (Table 5)

	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695 (71)

Water heating gains (Table 5)

	147.6227	144.9308	138.2447	120.8771	107.6627	100.1365	95.6677	100.3606	111.6933	124.2693	136.6642	146.1697 (72)

Total internal gains

	729.1407	726.0602	701.0938	652.4522	603.3501	564.9386	542.8624	547.9439	577.5570	621.4068	669.6895	710.0803 (73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	5.8000	19.6403	0.3000	0.0000	0.7700	26.3140	(76)
South	0.7800	46.7521	0.3000	0.0000	0.7700	8.4238	(78)
West	2.8100	19.6403	0.3000	0.0000	0.7700	12.7487	(80)

Solar gains	47.4865	90.2110	143.4182	203.3988	245.6287	250.1756	238.6758	207.2016	164.7202	105.5531	58.6917	39.4022 (83)
Total gains	776.6272	816.2712	844.5120	855.8510	848.9788	815.1142	781.5382	755.1455	742.2771	726.9599	728.3812	749.4825 (84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	28.1178	28.2909	28.4661	29.3755	29.5645	30.5467	30.5467	30.7510	30.1461	29.5645	29.1890	28.8230	
alpha	2.8745	2.8861	2.8977	2.9584	2.9710	3.0364	3.0364	3.0501	3.0097	2.9710	2.9459	2.9215	
util living area	0.9246	0.9090	0.8791	0.8215	0.7308	0.5836	0.4478	0.4763	0.6592	0.8241	0.8999	0.9297	(86)
Living	19.1069	19.3080	19.6651	20.1514	20.5483	20.8454	20.9487	20.9375	20.7594	20.2703	19.6498	19.1071	
Non living	18.5319	18.7321	19.0846	19.5703	19.9476	20.2286	20.3096	20.3059	20.1509	19.6923	19.0850	18.5439	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.0316	19.3080	19.6651	20.1514	20.5483	20.8454	20.9487	20.9375	20.7594	20.2703	19.6498	19.3719	(87)
Th 2	20.2859	20.2899	20.2940	20.3144	20.3185	20.3391	20.3391	20.3432	20.3309	20.3185	20.3103	20.3022	(88)
util rest of house	0.9172	0.9002	0.8669	0.8029	0.7010	0.5377	0.3881	0.4173	0.6163	0.8024	0.8889	0.9229	(89)
MIT 2	19.3886	18.7321	19.0846	19.5703	19.9476	20.2286	20.3096	20.3059	20.1509	19.6923	19.0850	18.7898	(90)
Living area fraction									fLA = Living area / (4) =			0.2917	(91)
MIT	19.5762	18.9001	19.2539	19.7399	20.1229	20.4085	20.4960	20.4902	20.3284	19.8610	19.2498	18.9596	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5762	18.9001	19.2539	19.7399	20.1229	20.4085	20.4960	20.4902	20.3284	19.8610	19.2498	18.9596	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9090	0.8795	0.8461	0.7855	0.6917	0.5427	0.4026	0.4309	0.6162	0.7861	0.8691	0.9073	(94)
Useful gains	705.9283	717.9169	714.5525	672.2352	587.2735	442.3823	314.6667	325.3672	457.3695	571.4494	633.0009	679.9704	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1400.7665	1275.9032	1155.1813	951.4168	734.5546	490.2687	328.8463	342.9395	532.6987	807.6421	1073.2050	1320.2902	(97)
Space heating kWh	516.9596	374.9668	327.8278	201.0107	109.5771	0.0000	0.0000	0.0000	0.0000	175.7273	316.9470	476.3980	(98a)
Space heating requirement - total per year (kWh/year)												2499.4144	
Solar heating kWh	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	516.9596	374.9668	327.8278	201.0107	109.5771	0.0000	0.0000	0.0000	0.0000	175.7273	316.9470	476.3980	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2499.4144	
Space heating per m2											(98c) / (4) =	20.7869	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	280.7591	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	516.9596	374.9668	327.8278	201.0107	109.5771	0.0000	0.0000	0.0000	0.0000	175.7273	316.9470	476.3980	(98)
Space heating efficiency (main heating system 1)	280.7591	280.7591	280.7591	280.7591	280.7591	0.0000	0.0000	0.0000	0.0000	280.7591	280.7591	280.7591	(210)
Space heating fuel (main heating system)	184.1293	133.5547	116.7648	71.5955	39.0289	0.0000	0.0000	0.0000	0.0000	62.5901	112.8893	169.6821	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	273.7058	221.5632	191.8702	131.7934	93.2177	79.3164	76.0465	97.0428	132.5020	190.0299	239.8259	270.4545	(64)
Efficiency of water heater												279.7171	(216)
(217)m	279.7171	279.7171	279.7171	279.7171	279.7171	279.7171	279.7171	279.7171	279.7171	279.7171	279.7171	279.7171	(217)
Fuel for water heating, kWh/month	97.8509	79.2098	68.5944	47.1167	33.3257	28.3559	27.1869	34.6932	47.3700	67.9365	85.7387	96.6886	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	51.8101	46.7963	51.8101	50.1389	51.8101	50.1389	51.8101	51.8101	50.1389	51.8101	50.1389	51.8101	(231)
Lighting	37.6608	30.2129	27.2034	19.9304	15.3948	12.5777	14.0436	18.2544	23.7107	31.1097	35.1384	38.7075	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-38.4057	-57.3586	-86.8059	-101.2754	-110.7455	-101.0928	-99.9186	-93.1211	-80.9929	-66.7262	-43.0512	-32.7209	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-11.6808	-26.2214	-55.5403	-89.4966	-124.9373	-130.6209	-128.7329	-106.6528	-75.4702	-40.1197	-16.3586	-9.1929	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	890.2346	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	279.7171	
Water heating fuel used	714.0674	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.3580)		
mechanical ventilation fans (SFP = 1.3580)	530.0227	(230a)
pump for solar water heating	80.0000	(230g)
Total electricity for the above, kWh/year	610.0227	(231)
Electricity for lighting (calculated in Appendix L)	303.9443	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1727.2394	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	791.0296	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	890.2346	16.4900	146.7997	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	714.0674	16.4900	117.7497	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)

Pumps, fans and electric keep-hot	530.0227	16.4900	87.4007	(249)
Pump for solar water heating	80.0000	16.4900	13.1920	(249)
Energy for lighting	303.9443	16.4900	50.1204	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-912.2150	16.4900	-150.4243	
PV Unit electricity exported	-815.0244	5.5900	-45.5599	
Total			-195.9841	(252)
Total energy cost			219.2784	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.4777	(257)
SAP value		92.2560	
SAP rating (Section 12)		92	(258)
SAP band		A	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	890.2346	0.1549	137.8535	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	714.0674	0.1460	104.2863	(264)
Space and water heating			242.1398	(265)
Pumps, fans and electric keep-hot	610.0227	0.1387	84.6177	(267)
Energy for lighting	303.9443	0.1443	43.8686	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-912.2150	0.1340	-122.2614	
PV Unit electricity exported	-815.0244	0.1237	-100.8227	
Total			-223.0842	(269)
Total CO2, kg/year			147.5419	(272)
CO2 emissions per m2			1.2300	(273)
EI value			98.8035	
EI rating			99	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

Main dwelling	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	47.0600	(1b) x	2.4800	(2b) =	116.7088	(1b) - (3b)
First floor	49.7800	(1c) x	2.7800	(2c) =	138.3884	(1c) - (3c)
Second floor	23.4000	(1d) x	2.7700	(2d) =	64.8180	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	120.2400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		319.9152	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.2500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2125	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.6000	4.5000	4.5000	4.1000	4.2000	3.7000	3.5000	3.5000	3.7000	4.1000	4.1000	4.2000	(22)
Wind factor	1.1500	1.1250	1.1250	1.0250	1.0500	0.9250	0.8750	0.8750	0.9250	1.0250	1.0250	1.0500	(22a)
Adj infilt rate	0.2444	0.2391	0.2391	0.2178	0.2231	0.1966	0.1859	0.1859	0.1966	0.2178	0.2178	0.2231	(22b)

Balanced mechanical ventilation with heat recovery		
If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	80.1000	(23c)

Effective ac	0.3439	0.3386	0.3386	0.3173	0.3226	0.2961	0.2854	0.2854	0.2961	0.3173	0.3173	0.3226 (25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Door			4.1400	1.0000	4.1400			(26)
Window			9.3900	0.7752	7.2791			(27)
GF			47.0600	0.0900	4.2354	75.0000	3529.5000	(28a)
Exposed Floor			2.7200	0.1400	0.3808	20.0000	54.4000	(28b)
Main	129.1100	13.5300	115.5800	0.1300	15.0254	9.0000	1040.2200	(29a)
Dwarf Wall (PIRx0.72)	16.7700		16.7700	0.0900	1.5093	9.0000	150.9300	(29a)
PIJ	15.5100		15.5100	0.1300	2.0163	9.0000	139.5900	(30)
PIR	17.5400		17.5400	0.1300	2.2802	9.0000	157.8600	(30)
Residual Ceiling	26.3800		26.3800	0.0900	2.3742	9.0000	237.4200	(30)
Total net area of external elements Aum(A, m2)			255.0900					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		39.2407			(33)
Main dwelling								
Party Wall 1			47.6000	0.0000	0.0000	20.0000	952.0000	(32)
Timber			124.1700			9.0000	1117.5300	(32c)
FF			47.0600			18.0000	847.0800	(32d)
SF			23.4000			18.0000	421.2000	(32d)
GF			47.0600			9.0000	423.5400	(32e)
FF			23.4000			9.0000	210.6000	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	9281.8700 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		77.1945 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	9.3200	0.1150	1.0718
E3 Sill	9.3200	0.0170	0.1584
E4 Jamb	30.6000	0.0940	2.8764
E5 Ground floor (normal)	20.0500	0.0670	1.3434
E11 Eaves (insulation at rafter level)	18.1000	0.0250	0.4525
E16 Corner (normal)	24.0800	0.0680	1.6374
E12 Gable (insulation at ceiling level)	5.6600	0.0770	0.4358
E6 Intermediate floor within a dwelling	39.5500	0.0320	1.2656
E17 Corner (inverted - internal area greater than external area)	2.4800	-0.0290	-0.0719
P1 Party wall - Ground floor	9.0500	0.3200	2.8960
E20 Exposed floor (normal)	3.3800	0.0790	0.2670
E21 Exposed floor (inverted)	3.3800	0.0630	0.2129
E13 Gable (insulation at rafter level)	8.2800	0.0740	0.6127
E18 Party wall between dwellings	10.5200	0.0920	0.9678
R6 Flat ceiling	18.1000	-0.0430	-0.7783

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		13.3476 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	52.5883 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	36.3036	35.7427	35.7427	33.4993	34.0602	31.2559	30.1342	30.1342	31.2559	33.4993	33.4993	34.0602	(38)
Heat transfer coeff	88.8919	88.3310	88.3310	86.0876	86.6485	83.8442	82.7225	82.7225	83.8442	86.0876	86.0876	86.6485	(39)
Average = Sum(39)m / 12 =												85.8540	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7393	0.7346	0.7346	0.7160	0.7206	0.6973	0.6880	0.6880	0.6973	0.7160	0.7160	0.7206	(40)
HLP (average)												0.7140	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.8642	(42)
Hot water usage for mixer showers	72.2437	71.1580	69.5759	66.5490	64.3151	61.8240	60.4080	61.9781	63.6992	66.3739	69.4659	71.9669	(42a)
Hot water usage for baths	31.1904	30.7271	30.0748	28.8721	27.9715	26.9729	26.4334	27.0812	27.7865	28.8550	30.0826	31.0849	(42b)
Hot water usage for other uses	43.9627	42.3640	40.7654	39.1667	37.5681	35.9694	35.9694	37.5681	39.1667	40.7654	42.3640	43.9627	(42c)
Average daily hot water use (litres/day)												135.4907	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	147.3967	144.2491	140.4161	134.5878	129.8547	124.7663	122.8109	126.6274	130.6524	135.9943	141.9125	147.0144	(44)
Energy conte	233.4403	205.4088	215.8143	184.2439	174.8094	153.4147	148.5292	156.7911	161.1075	184.5430	202.1803	230.1891	(45)
Energy content (annual)										Total = Sum(45)m =		2250.4717	
Distribution loss (46)m = 0.15 x (45)m	35.0160	30.8113	32.3722	27.6366	26.2214	23.0122	22.2794	23.5187	24.1661	27.6815	30.3271	34.5284	(46)
Water storage loss:													
Store volume												210.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5800	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8532	(55)
Total storage loss	26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(56)
If cylinder contains dedicated solar storage	17.0031	15.3576	17.0031	16.4546	17.0031	16.4546	17.0031	17.0031	16.4546	17.0031	16.4546	17.0031	(57)
Primary loss	23.2624	21.0112	21.8667	15.7584	10.4681	9.9053	10.2355	11.1660	17.1091	21.8667	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	273.7058	241.7776	254.6841	216.4569	202.2805	179.7746	175.7677	184.9602	194.6712	223.4127	241.1469	270.4545	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Aperture area of solar collector												3.0000	(H1)
Zero-loss collector efficiency												0.8000	(H2)
Collector linear heat loss coefficient												1.8000	(H3)
Collector 2nd order heat loss coefficient												0.0000	(H4)
Collector loop efficiency												0.9000	(H5)
Incidence angle modifier												1.0000	(H6)
Overshading factor												0.8000	(H8)
Overall heat loss coefficient of system												6.5000	(H10)
Heat loss coefficient of collector loop												3.9667	(H11)
Dedicated solar storage volume												75.0000	(H12)
If combined cylinder, total volume of cylinder												210.0000	(H13)

Effective solar volume												115.5000	(H14)
Reference volume												225.0000	(H15)
Storage tank correction coefficient												1.1814	(H16)
Heat delivered to hot water												605.2985	(H24)
Heat delivered to space heating												0.0000	(H29)
Solar input												605.2985	
Solar input	-0.0000	-14.4753	-57.1346	-80.0537	-101.5431	-95.3649	-92.1367	-79.1730	-57.3788	-28.0385	-0.0000	-0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	273.7058	227.3023	197.5495	136.4032	100.7374	84.4097	83.6309	105.7872	137.2924	195.3743	241.1469	270.4545	(64)
											Total per year (kWh/year) = Sum(64)m =	2053.7941	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
											Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	0.0000	(64a)
Heat gains from water heating, kWh/month													
	109.8313	97.3935	102.8540	87.0315	80.1010	72.0983	71.1768	74.6683	80.4192	92.4563	98.3982	108.7502	(65)

5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	43.0265	38.2157	31.0791	23.5289	17.5881	14.8486	16.0445	20.8552	27.9918	35.5420	41.4828	44.2223	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	426.1571	430.5793	419.4356	395.7119	365.7649	337.6190	318.8159	314.3937	325.5374	349.2611	379.2081	407.3540	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	(71)
Water heating gains (Table 5)													
	147.6227	144.9308	138.2447	120.8771	107.6627	100.1365	95.6677	100.3606	111.6933	124.2693	136.6642	146.1697	(72)
Total internal gains													
	729.1407	726.0602	701.0938	652.4522	603.3501	564.9386	542.8624	547.9439	577.5570	621.4068	669.6895	710.0803	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	5.8000	16.6187	0.3000	0.0000	0.7700	22.2657	(76)
South	0.7800	39.5594	0.3000	0.0000	0.7700	7.1278	(78)
West	2.8100	16.6187	0.3000	0.0000	0.7700	10.7874	(80)

Solar gains	40.1809	80.1875	134.4546	193.9069	228.9976	237.6668	222.2589	190.0448	156.1261	97.5566	51.5775	35.6496	(83)
Total gains	769.3216	806.2477	835.5483	846.3591	832.3477	802.6054	765.1213	737.9887	733.6830	718.9635	721.2670	745.7299	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	29.0049	29.1890	29.1890	29.9497	29.7558	30.7510	31.1680	31.1680	30.7510	29.9497	29.9497	29.7558	
alpha	2.9337	2.9459	2.9459	2.9966	2.9837	3.0501	3.0779	3.0779	3.0501	2.9966	2.9966	2.9837	
util living area													
	0.9202	0.9040	0.8754	0.8108	0.7108	0.5605	0.4491	0.4720	0.6578	0.8191	0.8933	0.9248	(86)
Living	19.2557	19.4478	19.7457	20.2359	20.6146	20.8722	20.9508	20.9423	20.7696	20.3116	19.7672	19.2629	
Non living	18.6931	18.8842	19.1752	19.6608	20.0121	20.2545	20.3231	20.3174	20.1706	19.7381	19.2119	18.7121	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.1077	19.4478	19.7457	20.2359	20.6146	20.8722	20.9508	20.9423	20.7696	20.3116	19.7672	19.5059	(87)
Th 2	20.3063	20.3103	20.3103	20.3268	20.3226	20.3432	20.3515	20.3515	20.3432	20.3268	20.3268	20.3226	(88)
util rest of house													
	0.9124	0.8947	0.8630	0.7910	0.6781	0.5122	0.3902	0.4126	0.6155	0.7968	0.8816	0.9176	(89)
MIT 2	19.4810	18.8842	19.1752	19.6608	20.0121	20.2545	20.3231	20.3174	20.1706	19.7381	19.2119	18.9374	(90)
Living area fraction											fLA = Living area / (4) =	0.2917	(91)
MIT	19.6638	19.0486	19.3417	19.8285	20.1879	20.4348	20.5062	20.4997	20.3453	19.9054	19.3739	19.1032	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6638	19.0486	19.3417	19.8285	20.1879	20.4348	20.5062	20.4997	20.3453	19.9054	19.3739	19.1032	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9043	0.8745	0.8428	0.7749	0.6712	0.5192	0.4046	0.4266	0.6157	0.7812	0.8623	0.9021	(94)
Useful gains	695.7021	705.0865	704.2117	655.8102	558.6324	416.6985	309.5806	314.8048	451.6930	561.6552	621.9319	672.6977	(95)
Ext temp.	4.7000	5.3000	6.7000	9.3000	12.3000	15.0000	16.6000	16.5000	14.1000	10.8000	7.5000	4.6000	(96)
Heat loss rate W													
	1330.1642	1214.4285	1116.6507	906.3775	683.4758	455.6726	323.1317	330.8675	523.6342	783.8641	1022.1953	1256.6835	(97)
Space heating kWh													
	472.0398	342.2778	306.8546	180.4084	92.8835	0.0000	0.0000	0.0000	0.0000	165.3234	288.1896	434.4854	(98a)
Space heating requirement - total per year (kWh/year)												2282.4626	
Solar heating kWh													
	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	472.0398	342.2778	306.8546	180.4084	92.8835	0.0000	0.0000	0.0000	0.0000	165.3234	288.1896	434.4854	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2282.4626	
Space heating per m2											(98c) / (4) =	18.9826	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												279.8754	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	472.0398	342.2778	306.8546	180.4084	92.8835	0.0000	0.0000	0.0000	0.0000	165.3234	288.1896	434.4854	(98)
Space heating efficiency (main heating system 1)													
	279.8754	279.8754	279.8754	279.8754	279.8754	0.0000	0.0000	0.0000	0.0000	279.8754	279.8754	279.8754	(210)
Space heating fuel (main heating system)													
	168.6607	122.2965	109.6397	64.4603	33.1875	0.0000	0.0000	0.0000	0.0000	59.0704	102.9707	155.2425	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	273.7058	227.3023	197.5495	136.4032	100.7374	84.4097	83.6309	105.7872	137.2924	195.3743	241.1469	270.4545	(64)
Efficiency of water heater												279.7257	(216)
(217)m	279.7257	279.7257	279.7257	279.7257	279.7257	279.7257	279.7257	279.7257	279.7257	279.7257	279.7257	279.7257	(217)
Fuel for water heating, kWh/month													
	97.8479	81.2590	70.6226	48.7632	36.0129	30.1759	29.8975	37.8182	49.0811	69.8450	86.2084	96.6856	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	51.8101	46.7963	51.8101	50.1389	51.8101	50.1389	51.8101	51.8101	50.1389	51.8101	50.1389	51.8101	(231)
Lighting	37.6608	30.2129	27.2034	19.9304	15.3948	12.5777	14.0436	18.2544	23.7107	31.1097	35.1384	38.7075	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-33.1190	-51.9716	-82.5227	-97.6876	-105.7374	-98.3301	-96.1442	-88.5609	-78.2616	-62.7799	-38.5206	-29.8945	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-9.2619	-22.3217	-50.9270	-84.1817	-113.9877	-121.7979	-116.7800	-94.6713	-70.0382	-35.9716	-13.6881	-8.0275	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												815.5282	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												279.7257	
Water heating fuel used												734.2172	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.3580)													
mechanical ventilation fans (SFP = 1.3580)												530.0227	(230a)
pump for solar water heating												80.0000	(230g)
Total electricity for the above, kWh/year												610.0227	(231)
Electricity for lighting (calculated in Appendix L)												303.9443	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1605.1846	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												858.5278	(238)

10a. Fuel costs - using BEDF prices (583)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	815.5282	28.4300	231.8547	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	734.2172	28.4300	208.7379	(247)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(247a)
Pumps, fans and electric keep-hot	530.0227	28.4300	150.6855	(249)
Pump for solar water heating	80.0000	28.4300	22.7440	(249)
Energy for lighting	303.9443	28.4300	86.4114	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-863.5300	28.4300	-245.5016	
PV Unit electricity exported	-741.6546	5.8100	-43.0901	
Total			-288.5917	(252)
Total energy cost			411.8417	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	815.5282	0.1549	126.3192	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	734.2172	0.1456	106.9221	(264)
Space and water heating			233.2414	(265)
Pumps, fans and electric keep-hot	610.0227	0.1387	84.6177	(267)
Energy for lighting	303.9443	0.1443	43.8686	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-863.5300	0.1337	-115.4323	

PV Unit electricity exported	-741.6546	0.1235	-91.5746	
Total			-207.0070	(269)
Total CO2, kg/year			154.7207	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	815.5282	1.5734	1283.1810	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	734.2172	1.5387	1129.7307	(278)
Space and water heating			2412.9117	(279)
Pumps, fans and electric keep-hot	610.0227	1.5128	922.8423	(281)
Energy for lighting	303.9443	1.5338	466.1999	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-863.5300	1.4940	-1290.1179	
PV Unit electricity exported	-741.6546	0.4532	-336.0822	
Total			-1626.2001	(283)
Total Primary energy kWh/year			2175.7539	(286)

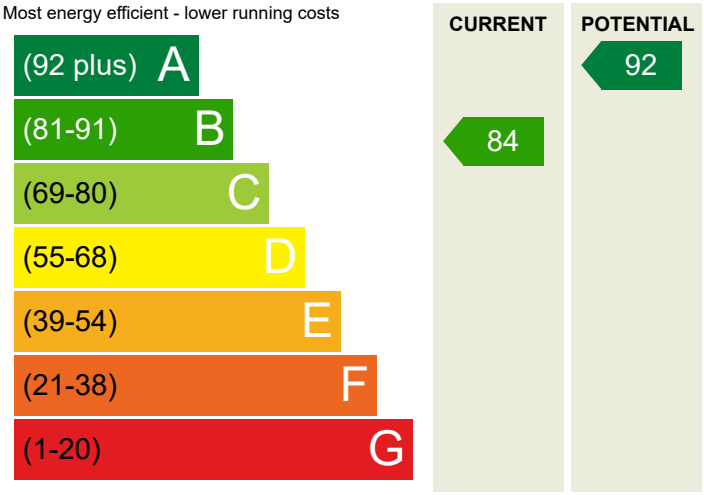
Energy Report

Dwelling Address	830 Rochdale Road, MANCHESTER, M9 8FA
Reference	78449-13-001
Assessment Date	02/07/2025
Submission Date	
Property Type	House, End-Terrace
Total Floor Area	120

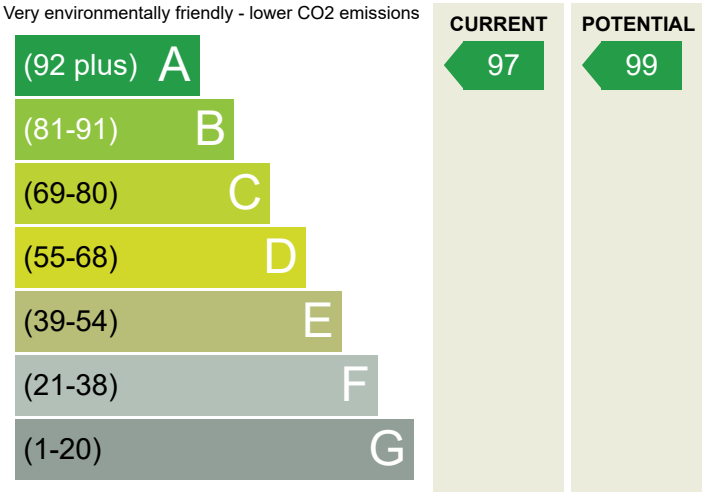
This Energy Report has been generated using the UK's National Calculation Methodology for dwellings, Standard Assessment Procedure (SAP). This methodology is used to assess the energy efficiency of dwellings which is calculated based on a dwelling's heating, hot water, ventilation and lighting usage.

This document is not an Energy Performance Certificate (EPC) as required by the Energy Performance of Buildings Regulations

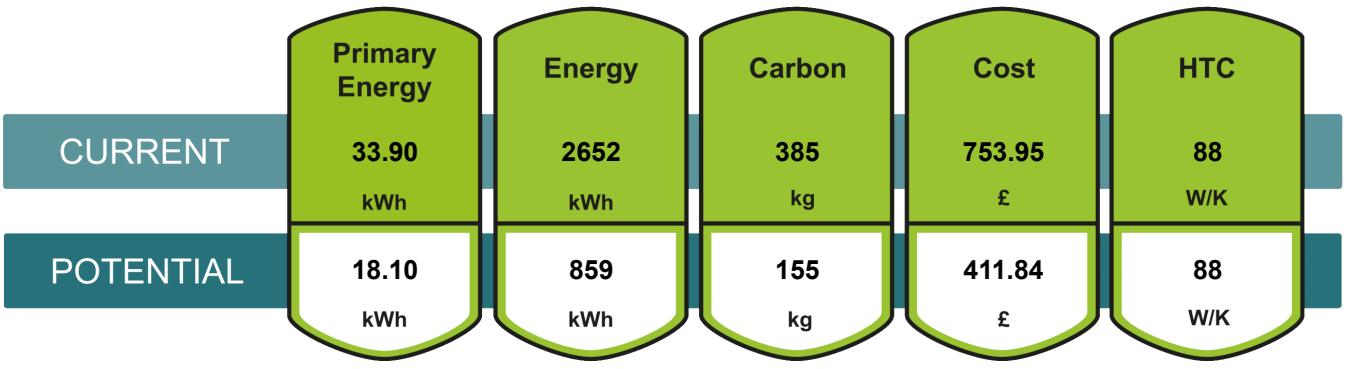
Energy Efficiency Rating



Carbon Dioxide (CO2) Emissions Rating



Additional ratings for your home



Energy Report

Breakdown of property's energy performance

Each feature is assessed as one of the following:

Very Poor | Poor | Average | Good | Very Good

Feature	Description	Energy Performance
Walls	Average thermal transmittance 0.12 W/m²K	Very Good
Roof	Average thermal transmittance 0.11 W/m²K	Very Good
Floor	Average thermal transmittance 0.09 W/m²K	Very Good
Windows	High performance glazing	Very Good
Main heating	Air source heat pump, radiators, electric	Good
Main heating controls	Programmer, room thermostat and TRVs	Good
Secondary heating	None	
Hot water	From main system	Good
Lighting	Good lighting efficiency	Good
Air tightness	Air permeability [AP50] = 5.0 m³/h.m² (as tested)	Good

Recommendations

The recommended measures provided below will help to improve the energy efficiency of the dwelling.
To reach the dwelling's potential energy rating all of the recommended measures shown below would need to be installed.
Having these measures installed individually or in any other order may give a different result when compared with the cumulative potential rating.

Recommended measures	Cumulative savings (per year)	Cumulative rating	Typical costs	Incremental savings (per year)	Cumulative CO2 rating
Solar water heating	£54	B 85	£4,000 - £7,000	£54	A 97
Photovoltaic	£342	A 92	£8,000 - £10,000	£289	A 99

Energy Report

The typical cost is based on average installation prices across the country so may not be representative of the actual costs in your area.

Estimated energy costs of the dwelling

The table below shows the estimated running costs of the space and water heating and lighting within the dwelling. It does not include the energy used from household appliances. The estimated annual costs after potential improvements indicates the total energy cost if all recommended measures named above were installed.

	Estimated annual costs	Estimated annual costs after potential improvements	Potential future savings
Lighting	£86	£86	
Heating	£379	£405	
Hot Water	£288	£209	
New Technologies e.g. Impact of PV	£0	-(£289)	
TOTAL	£754	£412	

Estimated energy use and potential savings

Space Heating
804
kWh per year

Water Heating
1014
kWh per year

Energy Report

About this document

Created by:	
Company/Trading name:	
Phone number:	
Email address:	

Disclaimer

This Energy Report should not under any circumstances be treated as a Condition Survey and cannot be used to indicate that any element of the dwelling (e.g.heating system) is working correctly.
This Energy Report must not be used in situations where an Energy Performance Certificate (EPC) is required.
This Energy Report is generated from a set of data inputs which may not reflect the actual dimensions, services or construction of the dwelling.
The calculation used to generate this report reflects the SAP Methodology current at the time of report generation.

Glossary terms for additional metrics

Primary Energy	The measure of the energy required for lighting, heating and hot water in a property. This includes the efficiency of the property's heating system, power station efficiency for electricity and the energy used to produce the fuel and deliver it to the property.
Energy Used	The estimated amount of fuel energy for lighting, heating and hot water for the property. The estimate is based on typical usage which is likely to be different to actual consumption.
Carbon (CO2)	The current emissions based on the energy estimates.
Cost	The estimated cost of energy. The cost of each unit of fuel is based on an industry standard which is likely to be different to those the occupier actually pays.
Heat Transfer Coefficient	Heat flow through the property envelope where internal and external temperatures are different.

Building Regulations England Part L (BREL) Compliance Report

Approved Document L1 2021 Edition, England assessed by Array SAP 10 program, Array

Date: Fri 03 Oct 2025 15:03:28

Project Information			
Assessed By	Paul Goddard	Building Type	House, End-terrace
OCDEA Registration	EES/005113	Assessment Date	2025-10-03

Dwelling Details			
Assessment Type	As built	Total Floor Area	120 m^2
Site Reference	78449-14	Plot Reference	001
Address	828 Rochdale Road, MANCHESTER, M9 8FA		

Client Details	
Name	-
Company	John Southworth
Address	Unit 10, Charles Street, DUKINFIELD, SK16 4SD

This report covers items included within the SAP calculations. It is not a complete report of regulations compliance.

1a Target emission rate and dwelling emission rate		
Fuel for main heating system	Electricity	
Target carbon dioxide emission rate	*10.82 $kgCO_2/m^2$*	
Dwelling carbon dioxide emission rate	3.37 $kgCO_2/m^2$	OK
1b Target primary energy rate and dwelling primary energy		
Target primary energy	*56.73 kWh_{PE}/m^2*	
Dwelling primary energy	35.59 kWh_{PE}/m^2	OK
1c Target fabric energy efficiency and dwelling fabric energy efficiency		
Target fabric energy efficiency	*38.7 kWh/m^2*	
Dwelling fabric energy efficiency	34.1 kWh/m^2	OK

2a Fabric U-values				
Element	***Maximum permitted average U-Value [W/m^2K]***	**Dwelling average U-Value [W/m^2K]**	**Element with highest individual U-Value**	
External walls	*0.26*	0.12	Walls (1) (0.13)	OK
Party walls	*0.2*	0	Party Wall (1) (0)	**N/A**
Curtain walls	*1.6*	0	N/A	**N/A**
Floors	*0.18*	0.09	Exposed Floor (0.14)	OK
Roofs	*0.16*	0.11	Roof (1) (0.13)	OK
Windows, doors, and roof windows	*1.6*	0.86	Front (1)	OK
Rooflights	*2.2*	N/A	N/A	**N/A**

2b Envelope elements (better than typically expected values are flagged with a subsequent (!))		
Name	**Net area [m^2]**	**U-Value [W/m^2K]**
Exposed wall: Walls (1)	114.1	0.13 **(!)**
Exposed wall: Walls (2)	16.77	0.09 **(!)**
Party wall: Party Wall (1)	47.6	0 **(!)**
Ground floor: GF, GF	47.06	0.09 **(!)**
Upper floor: Exposed Floor, Exposed Floor	2.72	0.14
Exposed roof: Roof (1)	15.51	0.13
Exposed roof: Roof (2)	17.54	0.13
Exposed roof: Roof (3)	26.38	0.09 **(!)**

2c Openings (better than typically expected values are flagged with a subsequent (!))				
Name	**Area [m^2]**	**Orientation**	**Frame factor**	**U-Value [W/m^2K]**
Front, Door	1.99	East	N/A	1 **(!)**
Front, Window	5.8	East	1.0	0.8 **(!)**
Rear, Window	2.81	West	1.0	0.8 **(!)**
Rear, Door	2.15	West	N/A	1 **(!)**
Side, Window	2.26	North	1.0	0.8 **(!)**

2d Thermal bridging (better than typically expected values are flagged with a subsequent (!))
Building part **1**: Thermal bridging calculated from linear thermal transmittances for each junction

Main element	Junction detail	Source	Psi value [W/mK]	Drawing / reference
External wall	E2: Other lintels (including other steel lintels)	Calculated by person with suitable expertise	0.115	Thermal Bridge Report
External wall	E3: Sill	Calculated by person with suitable expertise	0.017 **(!)**	Thermal Bridge Report
External wall	E4: Jamb	Calculated by person with suitable expertise	0.094	Thermal Bridge Report
External wall	E5: Ground floor (normal)	Calculated by person with suitable expertise	0.067	Thermal Bridge Report
External wall	E11: Eaves (insulation at rafter level)	Calculated by person with suitable expertise	0.025 **(!)**	Thermal Bridge Report
External wall	E16: Corner (normal)	Calculated by person with suitable expertise	0.068	Thermal Bridge Report
External wall	E12: Gable (insulation at ceiling level)	Calculated by person with suitable expertise	0.077	Thermal Bridge Report
External wall	E6: Intermediate floor within a dwelling	Calculated by person with suitable expertise	0.032 **(!)**	Thermal Bridge Report
External wall	E17: Corner (inverted - internal area greater than external area)	Calculated by person with suitable expertise	-0.029 **(!)**	Thermal Bridge Report
Party wall	P1: Ground floor	SAP table default	0.32	K1
External wall	E20: Exposed floor (normal)	Calculated by person with suitable expertise	0.079	Thermal Bridge Report
External wall	E21: Exposed floor (inverted)	Calculated by person with suitable expertise	0.063	Thermal Bridge Report
External wall	E13: Gable (insulation at rafter level)	Calculated by person with suitable expertise	0.074	Thermal Bridge Report
External wall	E18: Party wall between dwellings	Calculated by person with suitable expertise	0.092	Thermal Bridge Report
Roof	R6: Flat ceiling	Calculated by person with suitable expertise	-0.043	Thermal Bridge Report

3 Air permeability (better than typically expected values are flagged with a subsequent (!))		
Maximum permitted air permeability at 50Pa	*8 m^3/hm^2*	
Dwelling air permeability at 50Pa	5 m^3/hm^2, Measured value	OK
Air permeability test certificate reference		

4 Space heating	
Main heating system 1: Heat pump with radiators or underfloor heating - Electricity	
Efficiency	281.5%
Emitter type	Radiators
Flow temperature	45°C
System type	
Manufacturer	Daikin Europe NV
Model	EDLA09DA3V3
Commissioning	
Secondary heating system: N/A	
Fuel	N/A
Efficiency	N/A
Commissioning	

5 Hot water	
Cylinder/store - type: Cylinder	
Capacity	210 litres
Declared heat loss	1.58 kWh/day
Primary pipework insulated	Yes
Manufacturer	
Model	
Commissioning	
Waste water heat recovery system 1 - type: N/A	
Efficiency	
Manufacturer	
Model	

6 Controls		
Main heating 1 - type: Programmer, room thermostat and TRVs		
Function		
Ecodesign class		
Manufacturer		
Model		
Water heating - type: Cylinder thermostat and HW separately timed		
Manufacturer		
Model		

7 Lighting		
Minimum permitted light source efficacy	*75 lm/W*	
Lowest light source efficacy	80 lm/W	OK
External lights control	N/A	

8 Mechanical ventilation		
System type: Balanced whole-house mechanical ventilation with heat recovery		
Maximum permitted specific fan power	*1.5 W/(l/s)*	
Specific fan power	0.97 W/(l/s)	OK
Minimum permitted heat recovery efficiency	*73%*	
Heat recovery efficiency	89%	OK
Manufacturer/Model	DV110 Adroit	
Commissioning		

9 Local generation
N/A

10 Heat networks
N/A

11 Supporting documentary evidence	
Documentary evidence identified in 11.1 and 11.2 is needed to confirm the data values used for any calculations undertaken, manufacturer declarations made, and tests performed as reflected in this "As built" BREL Compliance Report are correct. 11.1 SAP Conventions, Appendix 1 (documentary evidence) schedules the minimum documentary evidence required. 11.2 Indicative photographic evidence of key stages during construction (guidance within Approved Document L, Volume 1 – Appendix B) that confirms the products identified in this BREL Compliance Report are used in this dwelling, and workmanship is of sufficient quality to support the calculated values claimed in 2a to 2d.	

12 Declarations	
a. Assessor Declaration	
This declaration by the assessor is confirmation that the contents of this BREL Compliance Report are a true and accurate reflection based upon the design and construction information submitted for this dwelling for the purpose of carrying out the assessment, and that the supporting documentary evidence (identified in 11.1 and 11.2) pursuant to Part L of the Building Regulations 2010 (as amended) has been reviewed in the course of preparing this BREL Compliance Report.	
Signed: Name:	Assessor ID: Date:
b. Client Declaration	
This declaration by the client is confirmation that the dwelling has been constructed and completed according to the specifications set out in this BREL Compliance Report, and that photographic evidence of key stages, as described in 11.2, has been provided to the Assessor for this dwelling.	
Signed: Name:	Organisation: Date:

Full SAP Calculation Printout

Property Reference	78449-14	**Issued on Date**	03/10/2025
Assessment Reference	001	**Prop Type Ref**	End
Property	828 Rochdale Road, MANCHESTER, M9 8FA		

SAP Rating	84 B	**DER**	3.37	**TER**	10.82
Environmental	97 A	**% DER < TER**			68.85
CO_2 Emissions (t/year)	0.39	**DFEE**	34.14	**TFEE**	38.73
Compliance Check	See BREL	**% DFEE < TFEE**			11.87
% DPER < TPER	37.26	**DPER**	35.59	**TPER**	56.73

Assessor Details	Mr. Daniel Goddard	**Assessor ID**	CP52-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.0600 (1b)	x	2.4800 (2b)	=	116.7088	(1b) - (3b)
First floor	49.7800 (1c)	x	2.7800 (2c)	=	138.3884	(1c) - (3c)
Second floor	23.4000 (1d)	x	2.7700 (2d)	=	64.8180	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	120.2400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	319.9152	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.2500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2125	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2709	0.2656	0.2603	0.2338	0.2284	0.2019	0.2019	0.1966	0.2125	0.2284	0.2391	0.2497	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	80.1000 (23c)

Effective ac	0.3704	0.3651	0.3598	0.3332	0.3279	0.3014	0.3014	0.2961	0.3120	0.3279	0.3386	0.3492	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door			4.1400	1.0000	4.1400			(26)
Window			10.8700	0.7752	8.4264			(27)
GF			47.0600	0.0900	4.2354	75.0000	3529.5000	(28a)
Exposed Floor			2.7200	0.1400	0.3808	20.0000	54.4000	(28b)
Main	129.1100	15.0100	114.1000	0.1300	14.8330	9.0000	1026.9000	(29a)
Dwarf Wall (PIRx0.72)	16.7700		16.7700	0.0900	1.5093	9.0000	150.9300	(29a)
PIJ	15.5100		15.5100	0.1300	2.0163	9.0000	139.5900	(30)
PIR	17.5400		17.5400	0.1300	2.2802	9.0000	157.8600	(30)
Residual Ceiling	26.3800		26.3800	0.0900	2.3742	9.0000	237.4200	(30)
Total net area of external elements Aum(A, m2)			255.0900					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		40.1956			(33)
Main dwelling								
Party Wall 1			47.6000	0.0000	0.0000	20.0000	952.0000	(32)

Timber	124.1700		9.0000	1117.5300 (32c)
FF	47.0600		18.0000	847.0800 (32d)
SF	23.4000		18.0000	421.2000 (32d)
GF	47.0600		9.0000	423.5400 (32e)
FF	23.4000		9.0000	210.6000 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 9268.5500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 77.0837 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	10.6900	0.1150	1.2293
E3 Sill	10.6900	0.0170	0.1817
E4 Jamb	35.1000	0.0940	3.2994
E5 Ground floor (normal)	20.0500	0.0670	1.3434
E11 Eaves (insulation at rafter level)	18.1000	0.0250	0.4525
E16 Corner (normal)	24.0800	0.0680	1.6374
E12 Gable (insulation at ceiling level)	5.6600	0.0770	0.4358
E6 Intermediate floor within a dwelling	39.5500	0.0320	1.2656
E17 Corner (inverted - internal area greater than external area)	2.4800	-0.0290	-0.0719
P1 Party wall - Ground floor	9.0500	0.3200	2.8960
E20 Exposed floor (normal)	3.3800	0.0790	0.2670
E21 Exposed floor (inverted)	3.3800	0.0630	0.2129
E13 Gable (insulation at rafter level)	8.2800	0.0740	0.6127
E18 Party wall between dwellings	10.5200	0.0920	0.9678
R6 Flat ceiling	18.1000	-0.0430	-0.7783

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 13.9515 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 54.1470 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	39.1078	38.5470	37.9861	35.1819	34.6210	31.8168	31.8168	31.2559	32.9385	34.6210	35.7427	36.8644	(38)
Heat transfer coeff	93.2549	92.6940	92.1332	89.3289	88.7681	85.9638	85.9638	85.4030	87.0855	88.7681	89.8898	91.0115	(39)
Average = Sum(39)m / 12 =												89.1887	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7756	0.7709	0.7662	0.7429	0.7383	0.7149	0.7149	0.7103	0.7243	0.7383	0.7476	0.7569	(40)
HLP (average)												0.7418	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.8642 (42)
Hot water usage for mixer showers

72.2437	71.1580	69.5759	66.5490	64.3151	61.8240	60.4080	61.9781	63.6992	66.3739	69.4659	71.9669	(42a)

Hot water usage for baths

31.1904	30.7271	30.0748	28.8721	27.9715	26.9729	26.4334	27.0812	27.7865	28.8550	30.0826	31.0849	(42b)

Hot water usage for other uses

43.9627	42.3640	40.7654	39.1667	37.5681	35.9694	35.9694	37.5681	39.1667	40.7654	42.3640	43.9627	(42c)

Average daily hot water use (litres/day) 135.4907 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	147.3967	144.2491	140.4161	134.5878	129.8547	124.7663	122.8109	126.6274	130.6524	135.9943	141.9125	147.0144	(44)
Energy conte	233.4403	205.4088	215.8143	184.2439	174.8094	153.4147	148.5292	156.7911	161.1075	184.5430	202.1803	230.1891	(45)
Energy content (annual)										Total = Sum(45)m =		2250.4717	
Distribution loss (46)m = 0.15 x (45)m	35.0160	30.8113	32.3722	27.6366	26.2214	23.0122	22.2794	23.5187	24.1661	27.6815	30.3271	34.5284	(46)
Water storage loss:													
Store volume												210.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5800	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8532	(55)
Total storage loss	26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(56)
If cylinder contains dedicated solar storage	26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	283.1519	250.3096	265.5259	232.3519	224.5210	201.5227	198.2408	206.5027	209.2155	234.2546	250.2883	279.9007	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	283.1519	250.3096	265.5259	232.3519	224.5210	201.5227	198.2408	206.5027	209.2155	234.2546	250.2883	279.9007	(64)
										Total per year (kWh/year) = Sum(64)m =		2835.7857	(64)
12Total per year (kWh/year)												2836	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	117.3882	104.2191	111.5276	99.7475	97.8934	89.4968	89.1552	91.9023	92.0546	101.1298	105.7114	116.3071	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	174.2040	192.8687	174.2040	180.0108	174.2040	180.0108	174.2040	174.2040	180.0108	174.2040	180.0108	174.2040	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	285.5253	288.4881	281.0218	265.1269	245.0625	226.2048	213.6066	210.6438	218.1101	234.0050	254.0694	272.9272	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	(71)
Water heating gains (Table 5)	157.7798	155.0879	149.9026	138.5382	131.5771	124.3011	119.8323	123.5246	127.8537	135.9272	146.8213	156.3268	(72)
Total internal gains	683.4727	702.4083	671.0920	649.6395	616.8072	596.4802	573.6065	574.3360	591.9381	610.0997	646.8651	669.4215	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	2.2600	10.6334	0.3000	0.0000	0.7700	5.5513	(74)
East	5.8000	19.6403	0.3000	0.0000	0.7700	26.3140	(76)
West	2.8100	19.6403	0.3000	0.0000	0.7700	12.7487	(80)

Solar gains	44.6140	87.0237	143.8714	212.4926	263.9373	272.0143	258.1998	219.2319	168.0366	103.3011	55.5548	36.7511	(83)
Total gains	728.0867	789.4321	814.9635	862.1321	880.7445	868.4945	831.8063	793.5679	759.9747	713.4009	702.4199	706.1726	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	27.6082	27.7752	27.9443	28.8215	29.0036	29.9498	29.9498	30.1465	29.5640	29.0036	28.6417	28.2887	
alpha	2.8405	2.8517	2.8630	2.9214	2.9336	2.9967	2.9967	3.0098	2.9709	2.9336	2.9094	2.8859	
util living area	0.9351	0.9162	0.8888	0.8222	0.7212	0.5630	0.4303	0.4630	0.6549	0.8326	0.9084	0.9391	(86)
Living	18.9703	19.2151	19.5775	20.1250	20.5512	20.8541	20.9516	20.9393	20.7550	20.2240	19.5653	18.9772	
Non living	18.3905	18.6336	18.9920	19.5364	19.9400	20.2241	20.3001	20.2959	20.1369	19.6404	18.9952	18.4088	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	19.9617	19.2151	19.5775	20.1250	20.5512	20.8541	20.9516	20.9393	20.7550	20.2240	19.5653	19.2602	(87)
Th 2	20.2746	20.2786	20.2827	20.3031	20.3072	20.3277	20.3277	20.3318	20.3194	20.3072	20.2990	20.2908	(88)
util rest of house	0.9285	0.9078	0.8772	0.8034	0.6906	0.5169	0.3713	0.4042	0.6115	0.8114	0.8981	0.9330	(89)
MIT 2	19.3107	18.6336	18.9920	19.5364	19.9400	20.2241	20.3001	20.2959	20.1369	19.6404	18.9952	18.6720	(90)
Living area fraction									fLA = Living area / (4) =			0.2917	(91)
MIT	19.5006	18.8032	19.1628	19.7082	20.1183	20.4079	20.4902	20.4836	20.3172	19.8107	19.1615	18.8436	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5006	18.8032	19.1628	19.7082	20.1183	20.4079	20.4902	20.4836	20.3172	19.8107	19.1615	18.8436	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9206	0.8871	0.8561	0.7855	0.6817	0.5226	0.3859	0.4179	0.6113	0.7942	0.8781	0.9178	(94)
Useful gains	670.2473	700.3407	697.6651	677.2155	600.3960	453.9089	321.0298	331.6573	464.5775	566.5643	616.7687	648.1550	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1417.5343	1288.7476	1166.6681	965.4813	747.2767	499.2715	334.4145	348.7491	541.4305	817.6140	1084.2062	1332.7368	(97)
Space heating kWh	555.9816	395.4094	348.9382	207.5514	109.2793	0.0000	0.0000	0.0000	0.0000	186.7810	336.5550	509.3289	(98a)
Space heating requirement - total per year (kWh/year)												2649.8248	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	555.9816	395.4094	348.9382	207.5514	109.2793	0.0000	0.0000	0.0000	0.0000	186.7810	336.5550	509.3289	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2649.8248	
Space heating per m2											(98c) / (4) =	22.0378	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	281.5100	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	555.9816	395.4094	348.9382	207.5514	109.2793	0.0000	0.0000	0.0000	0.0000	186.7810	336.5550	509.3289	(98)
Space heating efficiency (main heating system 1)	281.5100	281.5100	281.5100	281.5100	281.5100	0.0000	0.0000	0.0000	0.0000	281.5100	281.5100	281.5100	(210)
Space heating fuel (main heating system)	197.4998	140.4602	123.9523	73.7279	38.8190	0.0000	0.0000	0.0000	0.0000	66.3497	119.5535	180.9274	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	283.1519	250.3096	265.5259	232.3519	224.5210	201.5227	198.2408	206.5027	209.2155	234.2546	250.2883	279.9007	(64)
Efficiency of water heater												279.7098	(216)
(217)m	279.7098	279.7098	279.7098	279.7098	279.7098	279.7098	279.7098	279.7098	279.7098	279.7098	279.7098	279.7098	(217)
Fuel for water heating, kWh/month	101.2306	89.4891	94.9291	83.0689	80.2693	72.0471	70.8737	73.8275	74.7973	83.7492	89.4814	100.0682	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	45.0156	40.6593	45.0156	43.5635	45.0156	43.5635	45.0156	45.0156	43.5635	45.0156	43.5635	45.0156	(231)
Lighting	36.7038	29.4451	26.5121	19.4239	15.0036	12.2580	13.6868	17.7906	23.1082	30.3192	34.2455	37.7239	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													

(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	941.2897	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	279.7098	
Water heating fuel used	1013.8315	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.3580)		
mechanical ventilation fans (SFP = 1.3580)	530.0227	(230a)
Total electricity for the above, kWh/year	530.0227	(231)
Electricity for lighting (calculated in Appendix L)	296.2206	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2781.3644	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	941.2897	0.1550	145.8653	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1013.8315	0.1410	142.9367	(264)
Space and water heating			288.8020	(265)
Pumps, fans and electric keep-hot	530.0227	0.1387	73.5207	(267)
Energy for lighting	296.2206	0.1443	42.7538	(268)
Total CO2, kg/year			405.0764	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.3700	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	941.2897	1.5737	1481.2943	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1013.8315	1.5213	1542.3639	(278)
Space and water heating			3023.6582	(279)
Pumps, fans and electric keep-hot	530.0227	1.5128	801.8183	(281)
Energy for lighting	296.2206	1.5338	454.3530	(282)
Total Primary energy kWh/year			4279.8295	(286)
Dwelling Primary energy Rate (DPER)			35.5900	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.0600	(1b) x	2.4800	(2b) =	116.7088	(1b) - (3b)
First floor	49.7800	(1c) x	2.7800	(2c) =	138.3884	(1c) - (3c)
Second floor	23.4000	(1d) x	2.7700	(2d) =	64.8180	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	120.2400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		319.9152	(5)

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2. Ventilation rate

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	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	4 * 10 =	40.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1250 (8)
Pressure test		Yes
Pressure Test Method		Blower Door

Measured/design AP50	5.0000	(17)
Infiltration rate	0.3750	(18)
Number of sides sheltered	2	(19)
Shelter factor (20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) =	0.3188	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4064	0.3985	0.3905	0.3507	0.3427	0.3028	0.3028	0.2949	0.3188	0.3427	0.3586	0.3746	(22b)
Effective ac	0.5826	0.5794	0.5762	0.5615	0.5587	0.5459	0.5459	0.5435	0.5508	0.5587	0.5643	0.5701	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			4.1400	1.0000	4.1400			(26)
TER Opening Type			10.8700	1.1450	12.4466			(27)
GF			47.0600	0.1300	6.1178			(28a)
Exposed Floor			2.7200	0.1300	0.3536			(28b)
Main	129.1100	15.0100	114.1000	0.1800	20.5380			(29a)
Dwarf Wall (PIRx0.72)	16.7700		16.7700	0.1800	3.0186			(29a)
PIJ	15.5100		15.5100	0.1100	1.7061			(30)
PIR	17.5400		17.5400	0.1100	1.9294			(30)
Residual Ceiling	26.3800		26.3800	0.1100	2.9018			(30)
Total net area of external elements Aum(A, m2)			255.0900					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		53.1519			(33)
Main dwelling								
Party Wall 1			47.6000	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 77.0837 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	10.6900	0.0500	0.5345
E3 Sill	10.6900	0.0500	0.5345
E4 Jamb	35.1000	0.0500	1.7550
E5 Ground floor (normal)	20.0500	0.1600	3.2080
E11 Eaves (insulation at rafter level)	18.1000	0.0400	0.7240
E16 Corner (normal)	24.0800	0.0900	2.1672
E12 Gable (insulation at ceiling level)	5.6600	0.0600	0.3396
E6 Intermediate floor within a dwelling	39.5500	0.0000	0.0000
E17 Corner (inverted - internal area greater than external area)	2.4800	-0.0900	-0.2232
P1 Party wall - Ground floor	9.0500	0.0800	0.7240
E20 Exposed floor (normal)	3.3800	0.3200	1.0816
E21 Exposed floor (inverted)	3.3800	0.3200	1.0816
E13 Gable (insulation at rafter level)	8.2800	0.0800	0.6624
E18 Party wall between dwellings	10.5200	0.0600	0.6312
R6 Flat ceiling	18.1000	0.0600	1.0860

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	14.3064	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	67.4583	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	61.5060	61.1674	60.8355	59.2766	58.9849	57.6271	57.6271	57.3757	58.1501	58.9849	59.5749	60.1918	(38)
Heat transfer coeff	128.9643	128.6257	128.2938	126.7348	126.4431	125.0854	125.0854	124.8339	125.6084	126.4431	127.0332	127.6501	(39)
Average = Sum(39)m / 12 =												126.7334	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0726	1.0697	1.0670	1.0540	1.0516	1.0403	1.0403	1.0382	1.0446	1.0516	1.0565	1.0616	(40)
HLP (average)												1.0540	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.8642	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	72.2437	71.1580	69.5759	66.5490	64.3151	61.8240	60.4080	61.9781	63.6992	66.3739	69.4659	71.9669	(42a)
Hot water usage for baths	31.1904	30.7271	30.0748	28.8721	27.9715	26.9729	26.4334	27.0812	27.7865	28.8550	30.0826	31.0849	(42b)
Hot water usage for other uses	43.9627	42.3640	40.7654	39.1667	37.5681	35.9694	35.9694	37.5681	39.1667	40.7654	42.3640	43.9627	(42c)
Average daily hot water use (litres/day)												135.4907	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	147.3967	144.2491	140.4161	134.5878	129.8547	124.7663	122.8109	126.6274	130.6524	135.9943	141.9125	147.0144	(44)
Energy conte	233.4403	205.4088	215.8143	184.2439	174.8094	153.4147	148.5292	156.7911	161.1075	184.5430	202.1803	230.1891	(45)
Energy content (annual)										Total = Sum(45)m =		2250.4717	
Distribution loss (46)m = 0.15 x (45)m	35.0160	30.8113	32.3722	27.6366	26.2214	23.0122	22.2794	23.5187	24.1661	27.6815	30.3271	34.5284	(46)
Water storage loss:													
Store volume												210.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7016	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.9188	(55)
Total storage loss	28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842	(56)
If cylinder contains dedicated solar storage	28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	285.1869	252.1477	267.5609	234.3213	226.5560	203.4920	200.2757	208.5377	211.1848	236.2896	252.2577	281.9357	(62)
WWHRS	-33.0268	-29.2092	-30.5861	-25.3265	-23.6034	-20.1976	-18.9320	-20.1323	-20.8972	-24.6355	-27.9091	-32.4152	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	252.1601	222.9385	236.9748	208.9947	202.9525	183.2944	181.3437	188.4054	190.2876	211.6541	224.3486	249.5205	(64)

											Total per year (kWh/year) = Sum(64)m =	2552.8750	(64)
12Total per year (kWh/year)												2553	(64)
Electric shower(s)													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
											Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	0.0000	(64a)
Heat gains from water heating, kWh/month													
119.0162	105.6895	113.1555	101.3230	99.5214	91.0723	90.7832	93.5303	93.6301	102.7578	107.2868	117.9351	(65)	

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	169.7799	187.9706	169.7799	175.4392	169.7799	175.4392	169.7799	169.7799	175.4392	169.7799	175.4392	169.7799	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	285.5253	288.4881	281.0218	265.1269	245.0625	226.2048	213.6066	210.6438	218.1101	234.0050	254.0694	272.9272	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	(71)
Water heating gains (Table 5)													
	159.9680	157.2761	152.0908	140.7264	133.7653	126.4893	122.0205	125.7128	130.0418	138.1154	149.0095	158.5150	(72)
Total internal gains													
	684.2367	702.6984	671.8561	650.2561	617.5713	594.0968	571.3705	572.1000	589.5547	610.8638	647.4817	670.1856	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	2.2600	10.6334	0.6300	0.7000	0.7700	7.3443	(74)
East	5.8000	19.6403	0.6300	0.7000	0.7700	34.8135	(76)
West	2.8100	19.6403	0.6300	0.7000	0.7700	16.8665	(80)

Solar gains	59.0243	115.1324	190.3419	281.1277	349.1891	359.8749	341.5984	290.0438	222.3124	136.6674	73.4990	48.6217	(83)
Total gains	743.2610	817.8308	862.1980	931.3838	966.7603	953.9717	912.9689	862.1438	811.8671	747.5312	720.9807	718.8073	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	19.9636	20.0162	20.0680	20.3148	20.3617	20.5827	20.5827	20.6242	20.4970	20.3617	20.2671	20.1692	
alpha	2.3309	2.3344	2.3379	2.3543	2.3574	2.3722	2.3722	2.3749	2.3665	2.3574	2.3511	2.3446	
util living area													
	0.9435	0.9276	0.9037	0.8506	0.7674	0.6397	0.5148	0.5525	0.7256	0.8659	0.9242	0.9474	(86)
MIT	18.0511	18.3325	18.8000	19.4833	20.1110	20.6084	20.8346	20.7984	20.4297	19.6324	18.7528	18.0150	(87)
Th 2	20.0233	20.0256	20.0279	20.0386	20.0406	20.0499	20.0499	20.0516	20.0463	20.0406	20.0365	20.0323	(88)
util rest of house													
	0.9367	0.9188	0.8914	0.8301	0.7320	0.5790	0.4269	0.4667	0.6731	0.8435	0.9136	0.9411	(89)
MIT 2	16.5543	16.9110	17.5029	18.3621	19.1289	19.7084	19.9395	19.9102	19.5180	18.5605	17.4540	16.5134	(90)
Living area fraction										fLA = Living area / (4) =		0.2917	(91)
MIT	16.9910	17.3258	17.8813	18.6892	19.4154	19.9710	20.2006	20.1693	19.7840	18.8732	17.8330	16.9515	(92)
Temperature adjustment												0.0000	
adjusted MIT	16.9910	17.3258	17.8813	18.6892	19.4154	19.9710	20.2006	20.1693	19.7840	18.8732	17.8330	16.9515	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9066	0.8856	0.8556	0.7946	0.7053	0.5735	0.4418	0.4782	0.6566	0.8089	0.8805	0.9121	(94)
Useful gains	673.8142	724.2345	737.7096	740.0345	681.8849	547.1087	403.3514	412.2537	533.0848	604.6937	634.8452	655.6436	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
1636.6863	1598.2718	1460.1531	1240.6342	975.5619	671.8339	450.3863	470.5368	713.9600	1046.0939	1363.4432	1627.7316	(97)	
Space heating kWh													
716.3769	587.3530	537.4980	360.4318	218.4957	0.0000	0.0000	0.0000	0.0000	328.4018	524.5906	723.2335	(98a)	
Space heating requirement - total per year (kWh/year)												3996.3812	
Solar heating kWh													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)	
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
716.3769	587.3530	537.4980	360.4318	218.4957	0.0000	0.0000	0.0000	0.0000	328.4018	524.5906	723.2335	(98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												3996.3812	
Space heating per m2											(98c) / (4) =	33.2367	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	716.3769	587.3530	537.4980	360.4318	218.4957	0.0000	0.0000	0.0000	0.0000	328.4018	524.5906	723.2335	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	776.1396	636.3522	582.3380	390.5003	236.7234	0.0000	0.0000	0.0000	0.0000	355.7982	568.3538	783.5682	(211)

Space heating efficiency (main heating system 2)												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating												
Water heating requirement												
252.1601	222.9385	236.9748	208.9947	202.9525	183.2944	181.3437	188.4054	190.2876	211.6541	224.3486	249.5205	(64)
Efficiency of water heater												
(217)m											79.8000	(216)
86.2669	86.1275	85.8378	85.2703	84.2256	79.8000	79.8000	79.8000	79.8000	85.0411	85.8980	86.3033	(217)
Fuel for water heating, kWh/month												
292.3021	258.8472	276.0728	245.0967	240.9630	229.6923	227.2477	236.0970	238.4556	248.8844	261.1803	289.1205	(219)
Space cooling fuel requirement												
(221)m												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa												
7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting												
35.2769	28.3005	25.4814	18.6688	14.4203	11.7815	13.1547	17.0990	22.2098	29.1405	32.9142	36.2574	(232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m												
-44.8089	-63.5526	-91.8427	-103.7727	-112.2473	-104.8204	-103.4978	-97.5575	-87.1042	-72.9090	-49.3898	-38.6930	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m												
-24.0962	-50.8523	-101.4040	-152.7998	-202.5533	-203.7676	-201.3987	-170.2977	-124.5050	-72.9147	-32.2290	-19.0440	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	4329.7738	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	3043.9596	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	284.7049	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-2326.0585	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	5418.3798	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	4329.7738	0.2100	909.2525	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3043.9596	0.2100	639.2315	(264)
Space and water heating			1548.4840	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	284.7049	0.1443	41.0917	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-970.1961	0.1345	-130.4807	
PV Unit electricity exported	-1355.8623	0.1258	-170.5601	
Total			-301.0408	(269)
Total CO2, kg/year			1300.4642	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.8200	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	4329.7738	1.1300	4892.6444	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3043.9596	1.1300	3439.6743	(278)
Space and water heating			8332.3187	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	284.7049	1.5338	436.6899	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-970.1961	1.4970	-1452.4257	
PV Unit electricity exported	-1355.8623	0.4617	-626.0656	
Total			-2078.4913	(283)
Total Primary energy kWh/year			6820.6181	(286)
Target Primary Energy Rate (TPER)			56.7300	(287)

Full SAP Calculation Printout

Property Reference	78449-14	**Issued on Date**	03/10/2025
Assessment Reference	001	**Prop Type Ref**	End
Property	828 Rochdale Road, MANCHESTER, M9 8FA		

SAP Rating	84 B	**DER**	3.37	**TER**	10.82
Environmental	97 A	**% DER < TER**			68.85
CO_2 Emissions (t/year)	0.39	**DFEE**	34.14	**TFEE**	38.73
Compliance Check	See BREL	**% DFEE < TFEE**			11.87
% DPER < TPER	37.26	**DPER**	35.59	**TPER**	56.73

Assessor Details	Mr. Daniel Goddard	**Assessor ID**	CP52-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.0600 (1b)	x	2.4800 (2b)	=	116.7088	(1b) - (3b)
First floor	49.7800 (1c)	x	2.7800 (2c)	=	138.3884	(1c) - (3c)
Second floor	23.4000 (1d)	x	2.7700 (2d)	=	64.8180	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	120.2400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	319.9152	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	4 * 10 =	40.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1250	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3750	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3188	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4064	0.3985	0.3905	0.3507	0.3427	0.3028	0.3028	0.2949	0.3188	0.3427	0.3586	0.3746	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5826	0.5794	0.5762	0.5615	0.5587	0.5459	0.5459	0.5435	0.5508	0.5587	0.5643	0.5701	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door			4.1400	1.0000	4.1400			(26)
Window			10.8700	0.7752	8.4264			(27)
GF			47.0600	0.0900	4.2354	75.0000	3529.5000	(28a)
Exposed Floor			2.7200	0.1400	0.3808	20.0000	54.4000	(28b)
Main	129.1100	15.0100	114.1000	0.1300	14.8330	9.0000	1026.9000	(29a)
Dwarf Wall (PIRx0.72)	16.7700		16.7700	0.0900	1.5093	9.0000	150.9300	(29a)
PIJ	15.5100		15.5100	0.1300	2.0163	9.0000	139.5900	(30)
PIR	17.5400		17.5400	0.1300	2.2802	9.0000	157.8600	(30)
Residual Ceiling	26.3800		26.3800	0.0900	2.3742	9.0000	237.4200	(30)
Total net area of external elements Aum(A, m2)			255.0900					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		40.1956			(33)
Main dwelling								
Party Wall 1			47.6000	0.0000	0.0000	20.0000	952.0000	(32)
Timber			124.1700			9.0000	1117.5300	(32c)
FF			47.0600			18.0000	847.0800	(32d)
SF			23.4000			18.0000	421.2000	(32d)

GF	47.0600		9.0000	423.5400 (32e)
FF	23.4000		9.0000	210.6000 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 9268.5500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 77.0837 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	10.6900	0.1150	1.2293
E3 Sill	10.6900	0.0170	0.1817
E4 Jamb	35.1000	0.0940	3.2994
E5 Ground floor (normal)	20.0500	0.0670	1.3434
E11 Eaves (insulation at rafter level)	18.1000	0.0250	0.4525
E16 Corner (normal)	24.0800	0.0680	1.6374
E12 Gable (insulation at ceiling level)	5.6600	0.0770	0.4358
E6 Intermediate floor within a dwelling	39.5500	0.0320	1.2656
E17 Corner (inverted - internal area greater than external area)	2.4800	-0.0290	-0.0719
P1 Party wall - Ground floor	9.0500	0.3200	2.8960
E20 Exposed floor (normal)	3.3800	0.0790	0.2670
E21 Exposed floor (inverted)	3.3800	0.0630	0.2129
E13 Gable (insulation at rafter level)	8.2800	0.0740	0.6127
E18 Party wall between dwellings	10.5200	0.0920	0.9678
R6 Flat ceiling	18.1000	-0.0430	-0.7783

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 13.9515 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 54.1470 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	61.5060	61.1674	60.8355	59.2766	58.9849	57.6271	57.6271	57.3757	58.1501	58.9849	59.5749	60.1918	(38)
Heat transfer coeff	115.6531	115.3144	114.9825	113.4236	113.1319	111.7741	111.7741	111.5227	112.2971	113.1319	113.7220	114.3388	(39)

Average = Sum(39)m / 12 = 113.4222

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9619	0.9590	0.9563	0.9433	0.9409	0.9296	0.9296	0.9275	0.9339	0.9409	0.9458	0.9509	(40)
HLP (average)												0.9433	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.8642 (42)
Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

31.1904	30.7271	30.0748	28.8721	27.9715	26.9729	26.4334	27.0812	27.7865	28.8550	30.0826	31.0849	(42b)

Hot water usage for other uses

43.9627	42.3640	40.7654	39.1667	37.5681	35.9694	35.9694	37.5681	39.1667	40.7654	42.3640	43.9627	(42c)

Average daily hot water use (litres/day) 68.8844 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	75.1530	73.0911	70.8402	68.0388	65.5396	62.9423	62.4029	64.6493	66.9532	69.6204	72.4466	75.0476	(44)
Energy conte	119.0240	104.0808	108.8787	93.1417	88.2288	77.3949	75.4709	80.0493	82.5600	94.4742	103.2134	117.5064	(45)

Energy content (annual) Total = Sum(45)m = 1144.0232
Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss:
Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

101.1704	88.4687	92.5469	79.1705	74.9945	65.7857	64.1503	68.0419	70.1760	80.3031	87.7314	99.8804	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

101.1704	88.4687	92.5469	79.1705	74.9945	65.7857	64.1503	68.0419	70.1760	80.3031	87.7314	99.8804	(64)

Total per year (kWh/year) = Sum(64)m = 972.4197 (64)
12Total per year (kWh/year) 972 (64)
Electric shower(s)

57.8551	51.5494	56.2900	53.7168	54.7248	52.2022	53.9422	54.7248	53.7168	56.2900	55.2315	57.8551	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 658.0987 (64a)
Heat gains from water heating, kWh/month

39.7564	35.0045	37.2092	33.2218	32.4298	29.4970	29.5231	30.6917	30.9732	34.1483	35.7407	39.4339	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	174.2040	192.8687	174.2040	180.0108	174.2040	180.0108	174.2040	174.2040	180.0108	174.2040	180.0108	174.2040	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	285.5253	288.4881	281.0218	265.1269	245.0625	226.2048	213.6066	210.6438	218.1101	234.0050	254.0694	272.9272	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		(70)
Losses e.g. evaporation (negative values) (Table 5)	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	(71)
Water heating gains (Table 5)	53.4360	52.0901	50.0124	46.1414	43.5885	40.9680	39.6816	41.2523	43.0183	45.8982	49.6399	53.0025	(72)
Total internal gains	579.1289	599.4105	571.2018	557.2427	528.8186	513.1471	493.4558	492.0636	507.1028	520.0707	549.6837	566.0973	(73)

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6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains

	m2	Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	factor Table 6d	W	
North	2.2600	10.6334	0.3000	0.0000	0.7700	5.5513	(74)
East	5.8000	19.6403	0.3000	0.0000	0.7700	26.3140	(76)
West	2.8100	19.6403	0.3000	0.0000	0.7700	12.7487	(80)

Solar gains	44.6140	87.0237	143.8714	212.4926	263.9373	272.0143	258.1998	219.2319	168.0366	103.3011	55.5548	36.7511	(83)
Total gains	623.7428	686.4342	715.0732	769.7353	792.7559	785.1614	751.6556	711.2955	675.1394	623.3719	605.2385	602.8483	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	22.2614	22.3268	22.3912	22.6990	22.7575	23.0339	23.0339	23.0859	22.9266	22.7575	22.6394	22.5173	
alpha	2.4841	2.4885	2.4927	2.5133	2.5172	2.5356	2.5356	2.5391	2.5284	2.5172	2.5093	2.5012	
util living area	0.9583	0.9453	0.9270	0.8818	0.8082	0.6830	0.5550	0.5933	0.7640	0.8936	0.9425	0.9615	(86)
MIT	18.1619	18.4269	18.8574	19.5119	20.1165	20.6135	20.8389	20.8034	20.4420	19.6695	18.8350	18.1322	(87)
Th 2	20.1152	20.1176	20.1199	20.1308	20.1329	20.1424	20.1424	20.1442	20.1387	20.1329	20.1288	20.1244	(88)
util rest of house	0.9534	0.9388	0.9177	0.8655	0.7784	0.6281	0.4720	0.5131	0.7182	0.8757	0.9346	0.9570	(89)
MIT 2	17.4884	17.7517	18.1790	18.8273	19.4093	19.8698	20.0536	20.0306	19.7224	18.9892	18.1658	17.4648	(90)
Living area fraction										fLA = Living area / (4) =		0.2917	(91)
MIT	17.6849	17.9487	18.3770	19.0270	19.6156	20.0868	20.2827	20.2561	19.9324	19.1876	18.3610	17.6595	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.6849	17.9487	18.3770	19.0270	19.6156	20.0868	20.2827	20.2561	19.9324	19.1876	18.3610	17.6595	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9348	0.9175	0.8940	0.8402	0.7578	0.6242	0.4866	0.5245	0.7056	0.8515	0.9133	0.9394	(94)
Useful gains	583.0904	629.8230	639.2590	646.7503	600.7655	490.0983	365.7197	373.0494	476.4005	530.8268	552.7847	566.2941	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1548.0012	1504.7051	1365.6432	1148.6434	895.5068	613.2788	411.6308	430.0400	654.9570	971.5356	1280.6256	1538.9421	(97)
Space heating kWh	717.8937	587.9208	540.4299	361.3630	219.2876	0.0000	0.0000	0.0000	0.0000	327.8874	524.0454	723.6501	(98a)
Space heating requirement - total per year (kWh/year)												4002.4779	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	717.8937	587.9208	540.4299	361.3630	219.2876	0.0000	0.0000	0.0000	0.0000	327.8874	524.0454	723.6501	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4002.4779	
Space heating per m2											(98c) / (4) =	33.2874	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	1050.6770	827.1287	847.5725	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.6258	0.7001	0.6701	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	657.5374	579.0616	567.9821	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	824.1024	789.0936	745.6333	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	119.9268	156.2638	132.1725	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	29.9817	39.0659	33.0431	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												102.0908	(107)
Energy for space heating												33.2874	(99)
Energy for space cooling												0.8491	(108)
Total												34.1365	(109)
Fabric Energy Efficiency (DFEE)												34.1	(109)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.0600	(1b)	x 2.4800	(2b) =	116.7088	(1b) - (3b)
First floor	49.7800	(1c)	x 2.7800	(2c) =	138.3884	(1c) - (3c)
Second floor	23.4000	(1d)	x 2.7700	(2d) =	64.8180	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	120.2400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		319.9152	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	4 * 10 =	40.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1250	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3750	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3188	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4064	0.3985	0.3905	0.3507	0.3427	0.3028	0.3028	0.2949	0.3188	0.3427	0.3586	0.3746	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5826	0.5794	0.5762	0.5615	0.5587	0.5459	0.5459	0.5435	0.5508	0.5587	0.5643	0.5701	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			4.1400	1.0000	4.1400			(26)
TER Opening Type			10.8700	1.1450	12.4466			(27)
GF			47.0600	0.1300	6.1178			(28a)
Exposed Floor			2.7200	0.1300	0.3536			(28b)
Main	129.1100	15.0100	114.1000	0.1800	20.5380			(29a)
Dwarf Wall (PIRx0.72)	16.7700		16.7700	0.1800	3.0186			(29a)
PIJ	15.5100		15.5100	0.1100	1.7061			(30)
PIR	17.5400		17.5400	0.1100	1.9294			(30)
Residual Ceiling	26.3800		26.3800	0.1100	2.9018			(30)
Total net area of external elements Aum(A, m2)			255.0900					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		53.1519			(33)
Main dwelling								
Party Wall 1			47.6000	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K: 77.0837 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	10.6900	0.0500	0.5345
E3 Sill	10.6900	0.0500	0.5345
E4 Jamb	35.1000	0.0500	1.7550
E5 Ground floor (normal)	20.0500	0.1600	3.2080
E11 Eaves (insulation at rafter level)	18.1000	0.0400	0.7240
E16 Corner (normal)	24.0800	0.0900	2.1672
E12 Gable (insulation at ceiling level)	5.6600	0.0600	0.3396
E6 Intermediate floor within a dwelling	39.5500	0.0000	0.0000
E17 Corner (inverted - internal area greater than external area)	2.4800	-0.0900	-0.2232
P1 Party wall - Ground floor	9.0500	0.0800	0.7240
E20 Exposed floor (normal)	3.3800	0.3200	1.0816
E21 Exposed floor (inverted)	3.3800	0.3200	1.0816
E13 Gable (insulation at rafter level)	8.2800	0.0800	0.6624
E18 Party wall between dwellings	10.5200	0.0600	0.6312
R6 Flat ceiling	18.1000	0.0600	1.0860

Thermal bridges (Sum(L x Psi) calculated using Appendix K): 14.3064 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 67.4583 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	61.5060	61.1674	60.8355	59.2766	58.9849	57.6271	57.6271	57.3757	58.1501	58.9849	59.5749	60.1918	(38)
Heat transfer coeff	128.9643	128.6257	128.2938	126.7348	126.4431	125.0854	125.0854	124.8339	125.6084	126.4431	127.0332	127.6501	(39)
Average = Sum(39)m / 12 =												126.7334	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0726	1.0697	1.0670	1.0540	1.0516	1.0403	1.0403	1.0382	1.0446	1.0516	1.0565	1.0616	(40)
HLP (average)												1.0540	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy: 2.8642 (42)

Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

31.1904	30.7271	30.0748	28.8721	27.9715	26.9729	26.4334	27.0812	27.7865	28.8550	30.0826	31.0849	(42b)

Hot water usage for other uses

43.9627	42.3640	40.7654	39.1667	37.5681	35.9694	35.9694	37.5681	39.1667	40.7654	42.3640	43.9627	(42c)

Average daily hot water use (litres/day): 68.8844 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	75.1530	73.0911	70.8402	68.0388	65.5396	62.9423	62.4029	64.6493	66.9532	69.6204	72.4466	75.0476	(44)
Energy conte	119.0240	104.0808	108.8787	93.1417	88.2288	77.3949	75.4709	80.0493	82.5600	94.4742	103.2134	117.5064	(45)
Energy content (annual)										Total = Sum(45)m =		1144.0232	

Distribution loss (46)m = 0.15 x (45)m

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	101.1704	88.4687	92.5469	79.1705	74.9945	65.7857	64.1503	68.0419	70.1760	80.3031	87.7314	99.8804	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	101.1704	88.4687	92.5469	79.1705	74.9945	65.7857	64.1503	68.0419	70.1760	80.3031	87.7314	99.8804	(64)
										Total per year (kWh/year) = Sum(64)m =		972.4197	(64)
12Total per year (kWh/year)												972	(64)
Electric shower(s)													
	57.8551	51.5494	56.2900	53.7168	54.7248	52.2022	53.9422	54.7248	53.7168	56.2900	55.2315	57.8551	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		658.0987	(64a)
Heat gains from water heating, kWh/month													
	39.7564	35.0045	37.2092	33.2218	32.4298	29.4970	29.5231	30.6917	30.9732	34.1483	35.7407	39.4339	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	169.7799	187.9706	169.7799	175.4392	169.7799	175.4392	169.7799	169.7799	175.4392	169.7799	175.4392	169.7799	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	285.5253	288.4881	281.0218	265.1269	245.0625	226.2048	213.6066	210.6438	218.1101	234.0050	254.0694	272.9272	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	(71)
Water heating gains (Table 5)													
	53.4360	52.0901	50.0124	46.1414	43.5885	40.9680	39.6816	41.2523	43.0183	45.8982	49.6399	53.0025	(72)
Total internal gains													
	574.7048	594.5124	566.7777	552.6712	524.3945	508.5756	489.0317	487.6395	502.5312	515.6466	545.1121	561.6732	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	2.2600	10.6334	0.6300	0.7000	0.7700	7.3443	(74)
East	5.8000	19.6403	0.6300	0.7000	0.7700	34.8135	(76)
West	2.8100	19.6403	0.6300	0.7000	0.7700	16.8665	(80)

Solar gains	59.0243	115.1324	190.3419	281.1277	349.1891	359.8749	341.5984	290.0438	222.3124	136.6674	73.4990	48.6217	(83)
Total gains	633.7291	709.6448	757.1196	833.7988	873.5835	868.4505	830.6301	777.6833	724.8436	652.3140	618.6111	610.2948	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	19.9636	20.0162	20.0680	20.3148	20.3617	20.5827	20.5827	20.6242	20.4970	20.3617	20.2671	20.1692	
alpha	2.3309	2.3344	2.3379	2.3543	2.3574	2.3722	2.3722	2.3749	2.3665	2.3574	2.3511	2.3446	
util living area													
	0.9585	0.9445	0.9237	0.8751	0.7979	0.6743	0.5504	0.5917	0.7628	0.8933	0.9431	0.9619	(86)
MIT	17.8606	18.1530	18.6375	19.3554	20.0192	20.5577	20.8082	20.7650	20.3555	19.5002	18.5834	17.8234	(87)
Th 2	20.0233	20.0256	20.0279	20.0386	20.0406	20.0499	20.0499	20.0516	20.0463	20.0406	20.0365	20.0323	(88)
util rest of house													
	0.9533	0.9375	0.9135	0.8571	0.7650	0.6146	0.4602	0.5045	0.7134	0.8744	0.9348	0.9571	(89)
MIT 2	17.1330	17.4233	17.9035	18.6124	19.2494	19.7455	19.9485	19.9208	19.5743	18.7639	17.8596	17.1017	(90)
Living area fraction										fLA = Living area / (4) =		0.2917	(91)
MIT	17.3453	17.6362	18.1177	18.8292	19.4740	19.9825	20.1993	20.1671	19.8022	18.9787	18.0708	17.3122	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.3453	17.6362	18.1177	18.8292	19.4740	19.9825	20.1993	20.1671	19.8022	18.9787	18.0708	17.3122	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9334	0.9143	0.8873	0.8290	0.7424	0.6099	0.4755	0.5161	0.6987	0.8476	0.9118	0.9382	(94)
Useful gains	591.5207	648.8491	671.7570	691.1902	648.5114	529.6970	394.9888	401.3526	506.4825	552.8923	564.0612	572.5903	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1682.3721	1638.1981	1490.4736	1258.3691	982.9651	673.2662	450.2205	470.2592	716.2454	1059.4301	1393.6510	1673.7760	(97)
Space heating kWh													
	811.5935	664.8425	609.1252	408.3688	248.8336	0.0000	0.0000	0.0000	0.0000	376.8641	597.3047	819.2821	(98a)
Space heating requirement - total per year (kWh/year)												4536.2145	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	811.5935	664.8425	609.1252	408.3688	248.8336	0.0000	0.0000	0.0000	0.0000	376.8641	597.3047	819.2821	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4536.2145	
Space heating per m2											(98c) / (4) =	37.7263	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	1175.8024	925.6317	948.7378	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.6160	0.6880	0.6544	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	724.3448	636.8150	620.8832	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	926.4095	886.1541	827.8568	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	145.4866	185.5083	153.9884	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	36.3717	46.3771	38.4971	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												121.2458	(107)
Energy for space heating												37.7263	(99)
Energy for space cooling												1.0084	(108)
Total												38.7347	(109)
Fabric Energy Efficiency (TFEE)												38.7	(109)

Full SAP Calculation Printout

Property Reference	78449-14	**Issued on Date**	03/10/2025
Assessment Reference	001	**Prop Type Ref**	End
Property	828 Rochdale Road, MANCHESTER, M9 8FA		

SAP Rating	84 B	**DER**	3.37	**TER**	10.82
Environmental	97 A	**% DER < TER**			68.85
CO_2 Emissions (t/year)	0.39	**DFEE**	34.14	**TFEE**	38.73
Compliance Check	See BREL	**% DFEE < TFEE**			11.87
% DPER < TPER	37.26	**DPER**	35.59	**TPER**	56.73

Assessor Details	Mr. Daniel Goddard	**Assessor ID**	CP52-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.0600 (1b)	x	2.4800 (2b)	=	116.7088	(1b) - (3b)
First floor	49.7800 (1c)	x	2.7800 (2c)	=	138.3884	(1c) - (3c)
Second floor	23.4000 (1d)	x	2.7700 (2d)	=	64.8180	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	120.2400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	319.9152	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.2500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2125	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2709	0.2656	0.2603	0.2338	0.2284	0.2019	0.2019	0.1966	0.2125	0.2284	0.2391	0.2497	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	80.1000 (23c)

Effective ac	0.3704	0.3651	0.3598	0.3332	0.3279	0.3014	0.3014	0.2961	0.3120	0.3279	0.3386	0.3492	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door			4.1400	1.0000	4.1400			(26)
Window			10.8700	0.7752	8.4264			(27)
GF			47.0600	0.0900	4.2354	75.0000	3529.5000	(28a)
Exposed Floor			2.7200	0.1400	0.3808	20.0000	54.4000	(28b)
Main	129.1100	15.0100	114.1000	0.1300	14.8330	9.0000	1026.9000	(29a)
Dwarf Wall (PIRx0.72)	16.7700		16.7700	0.0900	1.5093	9.0000	150.9300	(29a)
PIJ	15.5100		15.5100	0.1300	2.0163	9.0000	139.5900	(30)
PIR	17.5400		17.5400	0.1300	2.2802	9.0000	157.8600	(30)
Residual Ceiling	26.3800		26.3800	0.0900	2.3742	9.0000	237.4200	(30)
Total net area of external elements Aum(A, m2)			255.0900					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		40.1956			(33)
Main dwelling								
Party Wall 1			47.6000	0.0000	0.0000	20.0000	952.0000	(32)

Timber	124.1700		9.0000	1117.5300 (32c)
FF	47.0600		18.0000	847.0800 (32d)
SF	23.4000		18.0000	421.2000 (32d)
GF	47.0600		9.0000	423.5400 (32e)
FF	23.4000		9.0000	210.6000 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 9268.5500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 77.0837 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	10.6900	0.1150	1.2293
E3 Sill	10.6900	0.0170	0.1817
E4 Jamb	35.1000	0.0940	3.2994
E5 Ground floor (normal)	20.0500	0.0670	1.3434
E11 Eaves (insulation at rafter level)	18.1000	0.0250	0.4525
E16 Corner (normal)	24.0800	0.0680	1.6374
E12 Gable (insulation at ceiling level)	5.6600	0.0770	0.4358
E6 Intermediate floor within a dwelling	39.5500	0.0320	1.2656
E17 Corner (inverted - internal area greater than external area)	2.4800	-0.0290	-0.0719
P1 Party wall - Ground floor	9.0500	0.3200	2.8960
E20 Exposed floor (normal)	3.3800	0.0790	0.2670
E21 Exposed floor (inverted)	3.3800	0.0630	0.2129
E13 Gable (insulation at rafter level)	8.2800	0.0740	0.6127
E18 Party wall between dwellings	10.5200	0.0920	0.9678
R6 Flat ceiling	18.1000	-0.0430	-0.7783

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 13.9515 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 54.1470 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	39.1078	38.5470	37.9861	35.1819	34.6210	31.8168	31.8168	31.2559	32.9385	34.6210	35.7427	36.8644	(38)
Heat transfer coeff	93.2549	92.6940	92.1332	89.3289	88.7681	85.9638	85.9638	85.4030	87.0855	88.7681	89.8898	91.0115	(39)
Average = Sum(39)m / 12 =												89.1887	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7756	0.7709	0.7662	0.7429	0.7383	0.7149	0.7149	0.7103	0.7243	0.7383	0.7476	0.7569	(40)
HLP (average)												0.7418	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.8642 (42)
Hot water usage for mixer showers

72.2437	71.1580	69.5759	66.5490	64.3151	61.8240	60.4080	61.9781	63.6992	66.3739	69.4659	71.9669	(42a)

Hot water usage for baths

31.1904	30.7271	30.0748	28.8721	27.9715	26.9729	26.4334	27.0812	27.7865	28.8550	30.0826	31.0849	(42b)

Hot water usage for other uses

43.9627	42.3640	40.7654	39.1667	37.5681	35.9694	35.9694	37.5681	39.1667	40.7654	42.3640	43.9627	(42c)

Average daily hot water use (litres/day) 135.4907 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	147.3967	144.2491	140.4161	134.5878	129.8547	124.7663	122.8109	126.6274	130.6524	135.9943	141.9125	147.0144	(44)
Energy conte	233.4403	205.4088	215.8143	184.2439	174.8094	153.4147	148.5292	156.7911	161.1075	184.5430	202.1803	230.1891	(45)
Energy content (annual)										Total = Sum(45)m =		2250.4717	
Distribution loss (46)m = 0.15 x (45)m	35.0160	30.8113	32.3722	27.6366	26.2214	23.0122	22.2794	23.5187	24.1661	27.6815	30.3271	34.5284	(46)
Water storage loss:													
Store volume												210.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5800	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8532	(55)
Total storage loss	26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(56)
If cylinder contains dedicated solar storage	26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	283.1519	250.3096	265.5259	232.3519	224.5210	201.5227	198.2408	206.5027	209.2155	234.2546	250.2883	279.9007	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	283.1519	250.3096	265.5259	232.3519	224.5210	201.5227	198.2408	206.5027	209.2155	234.2546	250.2883	279.9007	(64)
										Total per year (kWh/year) = Sum(64)m =		2835.7857	(64)
12Total per year (kWh/year)												2836	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	117.3882	104.2191	111.5276	99.7475	97.8934	89.4968	89.1552	91.9023	92.0546	101.1298	105.7114	116.3071	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	174.2040	192.8687	174.2040	180.0108	174.2040	180.0108	174.2040	174.2040	180.0108	174.2040	180.0108	174.2040	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	285.5253	288.4881	281.0218	265.1269	245.0625	226.2048	213.6066	210.6438	218.1101	234.0050	254.0694	272.9272	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	(71)
Water heating gains (Table 5)	157.7798	155.0879	149.9026	138.5382	131.5771	124.3011	119.8323	123.5246	127.8537	135.9272	146.8213	156.3268	(72)
Total internal gains	683.4727	702.4083	671.0920	649.6395	616.8072	596.4802	573.6065	574.3360	591.9381	610.0997	646.8651	669.4215	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	2.2600	10.6334	0.3000	0.0000	0.7700	5.5513	(74)
East	5.8000	19.6403	0.3000	0.0000	0.7700	26.3140	(76)
West	2.8100	19.6403	0.3000	0.0000	0.7700	12.7487	(80)

Solar gains	44.6140	87.0237	143.8714	212.4926	263.9373	272.0143	258.1998	219.2319	168.0366	103.3011	55.5548	36.7511	(83)
Total gains	728.0867	789.4321	814.9635	862.1321	880.7445	868.4945	831.8063	793.5679	759.9747	713.4009	702.4199	706.1726	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	27.6082	27.7752	27.9443	28.8215	29.0036	29.9498	29.9498	30.1465	29.5640	29.0036	28.6417	28.2887	
alpha	2.8405	2.8517	2.8630	2.9214	2.9336	2.9967	2.9967	3.0098	2.9709	2.9336	2.9094	2.8859	
util living area	0.9351	0.9162	0.8888	0.8222	0.7212	0.5630	0.4303	0.4630	0.6549	0.8326	0.9084	0.9391	(86)
Living	18.9703	19.2151	19.5775	20.1250	20.5512	20.8541	20.9516	20.9393	20.7550	20.2240	19.5653	18.9772	
Non living	18.3905	18.6336	18.9920	19.5364	19.9400	20.2241	20.3001	20.2959	20.1369	19.6404	18.9952	18.4088	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	19.9617	19.2151	19.5775	20.1250	20.5512	20.8541	20.9516	20.9393	20.7550	20.2240	19.5653	19.2602	(87)
Th 2	20.2746	20.2786	20.2827	20.3031	20.3072	20.3277	20.3277	20.3318	20.3194	20.3072	20.2990	20.2908	(88)
util rest of house	0.9285	0.9078	0.8772	0.8034	0.6906	0.5169	0.3713	0.4042	0.6115	0.8114	0.8981	0.9330	(89)
MIT 2	19.3107	18.6336	18.9920	19.5364	19.9400	20.2241	20.3001	20.2959	20.1369	19.6404	18.9952	18.6720	(90)
Living area fraction									fLA = Living area / (4) =			0.2917	(91)
MIT	19.5006	18.8032	19.1628	19.7082	20.1183	20.4079	20.4902	20.4836	20.3172	19.8107	19.1615	18.8436	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5006	18.8032	19.1628	19.7082	20.1183	20.4079	20.4902	20.4836	20.3172	19.8107	19.1615	18.8436	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9206	0.8871	0.8561	0.7855	0.6817	0.5226	0.3859	0.4179	0.6113	0.7942	0.8781	0.9178	(94)
Useful gains	670.2473	700.3407	697.6651	677.2155	600.3960	453.9089	321.0298	331.6573	464.5775	566.5643	616.7687	648.1550	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1417.5343	1288.7476	1166.6681	965.4813	747.2767	499.2715	334.4145	348.7491	541.4305	817.6140	1084.2062	1332.7368	(97)
Space heating kWh	555.9816	395.4094	348.9382	207.5514	109.2793	0.0000	0.0000	0.0000	0.0000	186.7810	336.5550	509.3289	(98a)
Space heating requirement - total per year (kWh/year)												2649.8248	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	555.9816	395.4094	348.9382	207.5514	109.2793	0.0000	0.0000	0.0000	0.0000	186.7810	336.5550	509.3289	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2649.8248	
Space heating per m2											(98c) / (4) =	22.0378	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	281.5100	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	555.9816	395.4094	348.9382	207.5514	109.2793	0.0000	0.0000	0.0000	0.0000	186.7810	336.5550	509.3289	(98)
Space heating efficiency (main heating system 1)	281.5100	281.5100	281.5100	281.5100	281.5100	0.0000	0.0000	0.0000	0.0000	281.5100	281.5100	281.5100	(210)
Space heating fuel (main heating system)	197.4998	140.4602	123.9523	73.7279	38.8190	0.0000	0.0000	0.0000	0.0000	66.3497	119.5535	180.9274	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	283.1519	250.3096	265.5259	232.3519	224.5210	201.5227	198.2408	206.5027	209.2155	234.2546	250.2883	279.9007	(64)
Efficiency of water heater												279.7098	(216)
(217)m	279.7098	279.7098	279.7098	279.7098	279.7098	279.7098	279.7098	279.7098	279.7098	279.7098	279.7098	279.7098	(217)
Fuel for water heating, kWh/month	101.2306	89.4891	94.9291	83.0689	80.2693	72.0471	70.8737	73.8275	74.7973	83.7492	89.4814	100.0682	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	45.0156	40.6593	45.0156	43.5635	45.0156	43.5635	45.0156	45.0156	43.5635	45.0156	43.5635	45.0156	(231)
Lighting	36.7038	29.4451	26.5121	19.4239	15.0036	12.2580	13.6868	17.7906	23.1082	30.3192	34.2455	37.7239	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													

(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	941.2897	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	279.7098	
Water heating fuel used	1013.8315	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.3580)		
mechanical ventilation fans (SFP = 1.3580)	530.0227	(230a)
Total electricity for the above, kWh/year	530.0227	(231)
Electricity for lighting (calculated in Appendix L)	296.2206	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2781.3644	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	941.2897	0.1550	145.8653	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1013.8315	0.1410	142.9367	(264)
Space and water heating			288.8020	(265)
Pumps, fans and electric keep-hot	530.0227	0.1387	73.5207	(267)
Energy for lighting	296.2206	0.1443	42.7538	(268)
Total CO2, kg/year			405.0764	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.3700	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	941.2897	1.5737	1481.2943	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1013.8315	1.5213	1542.3639	(278)
Space and water heating			3023.6582	(279)
Pumps, fans and electric keep-hot	530.0227	1.5128	801.8183	(281)
Energy for lighting	296.2206	1.5338	454.3530	(282)
Total Primary energy kWh/year			4279.8295	(286)
Dwelling Primary energy Rate (DPER)			35.5900	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.0600	(1b) x	2.4800	(2b) =	116.7088	(1b) - (3b)
First floor	49.7800	(1c) x	2.7800	(2c) =	138.3884	(1c) - (3c)
Second floor	23.4000	(1d) x	2.7700	(2d) =	64.8180	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	120.2400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		319.9152	(5)

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2. Ventilation rate

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	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	4 * 10 =	40.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1250 (8)
Pressure test		Yes
Pressure Test Method		Blower Door

Measured/design AP50	5.0000	(17)
Infiltration rate	0.3750	(18)
Number of sides sheltered	2	(19)
Shelter factor (20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) =	0.3188	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4064	0.3985	0.3905	0.3507	0.3427	0.3028	0.3028	0.2949	0.3188	0.3427	0.3586	0.3746	(22b)
Effective ac	0.5826	0.5794	0.5762	0.5615	0.5587	0.5459	0.5459	0.5435	0.5508	0.5587	0.5643	0.5701	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			4.1400	1.0000	4.1400			(26)
TER Opening Type			10.8700	1.1450	12.4466			(27)
GF			47.0600	0.1300	6.1178			(28a)
Exposed Floor			2.7200	0.1300	0.3536			(28b)
Main	129.1100	15.0100	114.1000	0.1800	20.5380			(29a)
Dwarf Wall (PIRx0.72)	16.7700		16.7700	0.1800	3.0186			(29a)
PIJ	15.5100		15.5100	0.1100	1.7061			(30)
PIR	17.5400		17.5400	0.1100	1.9294			(30)
Residual Ceiling	26.3800		26.3800	0.1100	2.9018			(30)
Total net area of external elements Aum(A, m2)			255.0900					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		53.1519			(33)
Main dwelling								
Party Wall 1			47.6000	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 77.0837 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	10.6900	0.0500	0.5345
E3 Sill	10.6900	0.0500	0.5345
E4 Jamb	35.1000	0.0500	1.7550
E5 Ground floor (normal)	20.0500	0.1600	3.2080
E11 Eaves (insulation at rafter level)	18.1000	0.0400	0.7240
E16 Corner (normal)	24.0800	0.0900	2.1672
E12 Gable (insulation at ceiling level)	5.6600	0.0600	0.3396
E6 Intermediate floor within a dwelling	39.5500	0.0000	0.0000
E17 Corner (inverted - internal area greater than external area)	2.4800	-0.0900	-0.2232
P1 Party wall - Ground floor	9.0500	0.0800	0.7240
E20 Exposed floor (normal)	3.3800	0.3200	1.0816
E21 Exposed floor (inverted)	3.3800	0.3200	1.0816
E13 Gable (insulation at rafter level)	8.2800	0.0800	0.6624
E18 Party wall between dwellings	10.5200	0.0600	0.6312
R6 Flat ceiling	18.1000	0.0600	1.0860

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	14.3064	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	67.4583	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	61.5060	61.1674	60.8355	59.2766	58.9849	57.6271	57.6271	57.3757	58.1501	58.9849	59.5749	60.1918	(38)
Heat transfer coeff	128.9643	128.6257	128.2938	126.7348	126.4431	125.0854	125.0854	124.8339	125.6084	126.4431	127.0332	127.6501	(39)
Average = Sum(39)m / 12 =												126.7334	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0726	1.0697	1.0670	1.0540	1.0516	1.0403	1.0403	1.0382	1.0446	1.0516	1.0565	1.0616	(40)
HLP (average)												1.0540	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.8642	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	72.2437	71.1580	69.5759	66.5490	64.3151	61.8240	60.4080	61.9781	63.6992	66.3739	69.4659	71.9669	(42a)
Hot water usage for baths	31.1904	30.7271	30.0748	28.8721	27.9715	26.9729	26.4334	27.0812	27.7865	28.8550	30.0826	31.0849	(42b)
Hot water usage for other uses	43.9627	42.3640	40.7654	39.1667	37.5681	35.9694	35.9694	37.5681	39.1667	40.7654	42.3640	43.9627	(42c)
Average daily hot water use (litres/day)												135.4907	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	147.3967	144.2491	140.4161	134.5878	129.8547	124.7663	122.8109	126.6274	130.6524	135.9943	141.9125	147.0144	(44)
Energy conte	233.4403	205.4088	215.8143	184.2439	174.8094	153.4147	148.5292	156.7911	161.1075	184.5430	202.1803	230.1891	(45)
Energy content (annual)										Total = Sum(45)m =		2250.4717	
Distribution loss (46)m = 0.15 x (45)m	35.0160	30.8113	32.3722	27.6366	26.2214	23.0122	22.2794	23.5187	24.1661	27.6815	30.3271	34.5284	(46)
Water storage loss:													
Store volume												210.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7016	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.9188	(55)
Total storage loss	28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842	(56)
If cylinder contains dedicated solar storage	28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	285.1869	252.1477	267.5609	234.3213	226.5560	203.4920	200.2757	208.5377	211.1848	236.2896	252.2577	281.9357	(62)
WWHRS	-33.0268	-29.2092	-30.5861	-25.3265	-23.6034	-20.1976	-18.9320	-20.1323	-20.8972	-24.6355	-27.9091	-32.4152	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	252.1601	222.9385	236.9748	208.9947	202.9525	183.2944	181.3437	188.4054	190.2876	211.6541	224.3486	249.5205	(64)

											Total per year (kWh/year) = Sum(64)m =	2552.8750	(64)
12Total per year (kWh/year)												2553	(64)
Electric shower(s)													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
											Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	0.0000	(64a)
Heat gains from water heating, kWh/month													
119.0162	105.6895	113.1555	101.3230	99.5214	91.0723	90.7832	93.5303	93.6301	102.7578	107.2868	117.9351	(65)	

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	169.7799	187.9706	169.7799	175.4392	169.7799	175.4392	169.7799	169.7799	175.4392	169.7799	175.4392	169.7799	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	285.5253	288.4881	281.0218	265.1269	245.0625	226.2048	213.6066	210.6438	218.1101	234.0050	254.0694	272.9272	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	(71)
Water heating gains (Table 5)													
	159.9680	157.2761	152.0908	140.7264	133.7653	126.4893	122.0205	125.7128	130.0418	138.1154	149.0095	158.5150	(72)
Total internal gains													
	684.2367	702.6984	671.8561	650.2561	617.5713	594.0968	571.3705	572.1000	589.5547	610.8638	647.4817	670.1856	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	2.2600	10.6334	0.6300	0.7000	0.7700	7.3443	(74)
East	5.8000	19.6403	0.6300	0.7000	0.7700	34.8135	(76)
West	2.8100	19.6403	0.6300	0.7000	0.7700	16.8665	(80)

Solar gains	59.0243	115.1324	190.3419	281.1277	349.1891	359.8749	341.5984	290.0438	222.3124	136.6674	73.4990	48.6217	(83)
Total gains	743.2610	817.8308	862.1980	931.3838	966.7603	953.9717	912.9689	862.1438	811.8671	747.5312	720.9807	718.8073	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	19.9636	20.0162	20.0680	20.3148	20.3617	20.5827	20.5827	20.6242	20.4970	20.3617	20.2671	20.1692	
alpha	2.3309	2.3344	2.3379	2.3543	2.3574	2.3722	2.3722	2.3749	2.3665	2.3574	2.3511	2.3446	
util living area													
	0.9435	0.9276	0.9037	0.8506	0.7674	0.6397	0.5148	0.5525	0.7256	0.8659	0.9242	0.9474	(86)
MIT	18.0511	18.3325	18.8000	19.4833	20.1110	20.6084	20.8346	20.7984	20.4297	19.6324	18.7528	18.0150	(87)
Th 2	20.0233	20.0256	20.0279	20.0386	20.0406	20.0499	20.0499	20.0516	20.0463	20.0406	20.0365	20.0323	(88)
util rest of house													
	0.9367	0.9188	0.8914	0.8301	0.7320	0.5790	0.4269	0.4667	0.6731	0.8435	0.9136	0.9411	(89)
MIT 2	16.5543	16.9110	17.5029	18.3621	19.1289	19.7084	19.9395	19.9102	19.5180	18.5605	17.4540	16.5134	(90)
Living area fraction										fLA = Living area / (4) =		0.2917	(91)
MIT	16.9910	17.3258	17.8813	18.6892	19.4154	19.9710	20.2006	20.1693	19.7840	18.8732	17.8330	16.9515	(92)
Temperature adjustment												0.0000	
adjusted MIT	16.9910	17.3258	17.8813	18.6892	19.4154	19.9710	20.2006	20.1693	19.7840	18.8732	17.8330	16.9515	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9066	0.8856	0.8556	0.7946	0.7053	0.5735	0.4418	0.4782	0.6566	0.8089	0.8805	0.9121	(94)
Useful gains	673.8142	724.2345	737.7096	740.0345	681.8849	547.1087	403.3514	412.2537	533.0848	604.6937	634.8452	655.6436	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
1636.6863	1598.2718	1460.1531	1240.6342	975.5619	671.8339	450.3863	470.5368	713.9600	1046.0939	1363.4432	1627.7316	(97)	
Space heating kWh													
716.3769	587.3530	537.4980	360.4318	218.4957	0.0000	0.0000	0.0000	0.0000	328.4018	524.5906	723.2335	(98a)	
Space heating requirement - total per year (kWh/year)												3996.3812	
Solar heating kWh													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)	
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
716.3769	587.3530	537.4980	360.4318	218.4957	0.0000	0.0000	0.0000	0.0000	328.4018	524.5906	723.2335	(98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												3996.3812	
Space heating per m2											(98c) / (4) =	33.2367	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	716.3769	587.3530	537.4980	360.4318	218.4957	0.0000	0.0000	0.0000	0.0000	328.4018	524.5906	723.2335	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	776.1396	636.3522	582.3380	390.5003	236.7234	0.0000	0.0000	0.0000	0.0000	355.7982	568.3538	783.5682	(211)

Space heating efficiency (main heating system 2)												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating												
Water heating requirement												
252.1601	222.9385	236.9748	208.9947	202.9525	183.2944	181.3437	188.4054	190.2876	211.6541	224.3486	249.5205	(64)
Efficiency of water heater												
(217)m											79.8000	(216)
86.2669	86.1275	85.8378	85.2703	84.2256	79.8000	79.8000	79.8000	79.8000	85.0411	85.8980	86.3033	(217)
Fuel for water heating, kWh/month												
292.3021	258.8472	276.0728	245.0967	240.9630	229.6923	227.2477	236.0970	238.4556	248.8844	261.1803	289.1205	(219)
Space cooling fuel requirement												
(221)m												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa												
7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting												
35.2769	28.3005	25.4814	18.6688	14.4203	11.7815	13.1547	17.0990	22.2098	29.1405	32.9142	36.2574	(232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m												
-44.8089	-63.5526	-91.8427	-103.7727	-112.2473	-104.8204	-103.4978	-97.5575	-87.1042	-72.9090	-49.3898	-38.6930	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m												
-24.0962	-50.8523	-101.4040	-152.7998	-202.5533	-203.7676	-201.3987	-170.2977	-124.5050	-72.9147	-32.2290	-19.0440	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	4329.7738	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	3043.9596	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	284.7049	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-2326.0585	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	5418.3798	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	4329.7738	0.2100	909.2525	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3043.9596	0.2100	639.2315	(264)
Space and water heating			1548.4840	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	284.7049	0.1443	41.0917	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-970.1961	0.1345	-130.4807	
PV Unit electricity exported	-1355.8623	0.1258	-170.5601	
Total			-301.0408	(269)
Total CO2, kg/year			1300.4642	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.8200	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	4329.7738	1.1300	4892.6444	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3043.9596	1.1300	3439.6743	(278)
Space and water heating			8332.3187	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	284.7049	1.5338	436.6899	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-970.1961	1.4970	-1452.4257	
PV Unit electricity exported	-1355.8623	0.4617	-626.0656	
Total			-2078.4913	(283)
Total Primary energy kWh/year			6820.6181	(286)
Target Primary Energy Rate (TPER)			56.7300	(287)

Full SAP Calculation Printout

Property Reference	78449-14	**Issued on Date**	03/10/2025
Assessment Reference	001	**Prop Type Ref**	End
Property	828 Rochdale Road, MANCHESTER, M9 8FA		

SAP Rating	84 B	**DER**	3.37	**TER**	10.82
Environmental	97 A	**% DER < TER**			68.85
CO_2 Emissions (t/year)	0.39	**DFEE**	34.14	**TFEE**	38.73
Compliance Check	See BREL	**% DFEE < TFEE**			11.87
% DPER < TPER	37.26	**DPER**	35.59	**TPER**	56.73

Assessor Details	Mr. Daniel Goddard	**Assessor ID**	CP52-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.0600 (1b)	x	2.4800 (2b)	=	116.7088	(1b) - (3b)
First floor	49.7800 (1c)	x	2.7800 (2c)	=	138.3884	(1c) - (3c)
Second floor	23.4000 (1d)	x	2.7700 (2d)	=	64.8180	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	120.2400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	319.9152	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.2500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2125	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2709	0.2656	0.2603	0.2338	0.2284	0.2019	0.2019	0.1966	0.2125	0.2284	0.2391	0.2497	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	80.1000 (23c)

Effective ac	0.3704	0.3651	0.3598	0.3332	0.3279	0.3014	0.3014	0.2961	0.3120	0.3279	0.3386	0.3492	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door			4.1400	1.0000	4.1400			(26)
Window			10.8700	0.7752	8.4264			(27)
GF			47.0600	0.0900	4.2354	75.0000	3529.5000	(28a)
Exposed Floor			2.7200	0.1400	0.3808	20.0000	54.4000	(28b)
Main	129.1100	15.0100	114.1000	0.1300	14.8330	9.0000	1026.9000	(29a)
Dwarf Wall (PIRx0.72)	16.7700		16.7700	0.0900	1.5093	9.0000	150.9300	(29a)
PIJ	15.5100		15.5100	0.1300	2.0163	9.0000	139.5900	(30)
PIR	17.5400		17.5400	0.1300	2.2802	9.0000	157.8600	(30)
Residual Ceiling	26.3800		26.3800	0.0900	2.3742	9.0000	237.4200	(30)
Total net area of external elements Aum(A, m2)			255.0900					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		40.1956			(33)
Main dwelling								
Party Wall 1			47.6000	0.0000	0.0000	20.0000	952.0000	(32)

Timber	124.1700		9.0000	1117.5300 (32c)
FF	47.0600		18.0000	847.0800 (32d)
SF	23.4000		18.0000	421.2000 (32d)
GF	47.0600		9.0000	423.5400 (32e)
FF	23.4000		9.0000	210.6000 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 9268.5500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 77.0837 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	10.6900	0.1150	1.2293
E3 Sill	10.6900	0.0170	0.1817
E4 Jamb	35.1000	0.0940	3.2994
E5 Ground floor (normal)	20.0500	0.0670	1.3434
E11 Eaves (insulation at rafter level)	18.1000	0.0250	0.4525
E16 Corner (normal)	24.0800	0.0680	1.6374
E12 Gable (insulation at ceiling level)	5.6600	0.0770	0.4358
E6 Intermediate floor within a dwelling	39.5500	0.0320	1.2656
E17 Corner (inverted - internal area greater than external area)	2.4800	-0.0290	-0.0719
P1 Party wall - Ground floor	9.0500	0.3200	2.8960
E20 Exposed floor (normal)	3.3800	0.0790	0.2670
E21 Exposed floor (inverted)	3.3800	0.0630	0.2129
E13 Gable (insulation at rafter level)	8.2800	0.0740	0.6127
E18 Party wall between dwellings	10.5200	0.0920	0.9678
R6 Flat ceiling	18.1000	-0.0430	-0.7783

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 13.9515 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 54.1470 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	39.1078	38.5470	37.9861	35.1819	34.6210	31.8168	31.8168	31.2559	32.9385	34.6210	35.7427	36.8644	(38)
Heat transfer coeff	93.2549	92.6940	92.1332	89.3289	88.7681	85.9638	85.9638	85.4030	87.0855	88.7681	89.8898	91.0115	(39)
Average = Sum(39)m / 12 =												89.1887	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7756	0.7709	0.7662	0.7429	0.7383	0.7149	0.7149	0.7103	0.7243	0.7383	0.7476	0.7569	(40)
HLP (average)												0.7418	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.8642 (42)
Hot water usage for mixer showers

72.2437	71.1580	69.5759	66.5490	64.3151	61.8240	60.4080	61.9781	63.6992	66.3739	69.4659	71.9669	(42a)

Hot water usage for baths

31.1904	30.7271	30.0748	28.8721	27.9715	26.9729	26.4334	27.0812	27.7865	28.8550	30.0826	31.0849	(42b)

Hot water usage for other uses

43.9627	42.3640	40.7654	39.1667	37.5681	35.9694	35.9694	37.5681	39.1667	40.7654	42.3640	43.9627	(42c)

Average daily hot water use (litres/day) 135.4907 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	147.3967	144.2491	140.4161	134.5878	129.8547	124.7663	122.8109	126.6274	130.6524	135.9943	141.9125	147.0144	(44)
Energy conte	233.4403	205.4088	215.8143	184.2439	174.8094	153.4147	148.5292	156.7911	161.1075	184.5430	202.1803	230.1891	(45)
Energy content (annual)										Total = Sum(45)m =		2250.4717	
Distribution loss (46)m = 0.15 x (45)m	35.0160	30.8113	32.3722	27.6366	26.2214	23.0122	22.2794	23.5187	24.1661	27.6815	30.3271	34.5284	(46)
Water storage loss:													
Store volume												210.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5800	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8532	(55)
Total storage loss	26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(56)
If cylinder contains dedicated solar storage	26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	283.1519	250.3096	265.5259	232.3519	224.5210	201.5227	198.2408	206.5027	209.2155	234.2546	250.2883	279.9007	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	283.1519	250.3096	265.5259	232.3519	224.5210	201.5227	198.2408	206.5027	209.2155	234.2546	250.2883	279.9007	(64)
										Total per year (kWh/year) = Sum(64)m =		2835.7857	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	117.3882	104.2191	111.5276	99.7475	97.8934	89.4968	89.1552	91.9023	92.0546	101.1298	105.7114	116.3071	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	41.9331	37.2446	30.2893	22.9310	17.1412	14.4713	15.6368	20.3252	27.2805	34.6389	40.4287	43.0985	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	426.1571	430.5793	419.4356	395.7119	365.7649	337.6190	318.8159	314.3937	325.5374	349.2611	379.2081	407.3540	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	(71)
Water heating gains (Table 5)	157.7798	155.0879	149.9026	138.5382	131.5771	124.3011	119.8323	123.5246	127.8537	135.9272	146.8213	156.3268	(72)
Total internal gains	738.2044	735.2462	711.9619	669.5154	626.8177	588.7258	566.6193	570.5780	593.0060	632.1616	678.7925	719.1137	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	2.2600	10.6334	0.3000	0.0000	0.7700	5.5513	(74)
East	5.8000	19.6403	0.3000	0.0000	0.7700	26.3140	(76)
West	2.8100	19.6403	0.3000	0.0000	0.7700	12.7487	(80)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	44.6140	87.0237	143.8714	212.4926	263.9373	272.0143	258.1998	219.2319	168.0366	103.3011	55.5548	36.7511	(83)
Total gains	782.8184	822.2699	855.8334	882.0080	890.7550	860.7401	824.8191	789.8098	761.0426	735.4627	734.3473	755.8648	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	27.6082	27.7752	27.9443	28.8215	29.0036	29.9498	29.9498	30.1465	29.5640	29.0036	28.6417	28.2887	
alpha	2.8405	2.8517	2.8630	2.9214	2.9336	2.9967	2.9967	3.0098	2.9709	2.9336	2.9094	2.8859	
util living area	0.9241	0.9088	0.8777	0.8151	0.7168	0.5668	0.4335	0.4649	0.6543	0.8234	0.8996	0.9292	(86)
Living	19.0689	19.2708	19.6399	20.1488	20.5590	20.8514	20.9506	20.9386	20.7557	20.2514	19.6182	19.0688	
Non living	18.4867	18.6876	19.0517	19.5584	19.9467	20.2221	20.2995	20.2954	20.1374	19.6655	19.0460	18.4982	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.0121	19.2708	19.6399	20.1488	20.5590	20.8514	20.9506	20.9386	20.7557	20.2514	19.6182	19.3390	(87)
Th 2	20.2746	20.2786	20.2827	20.3031	20.3072	20.3277	20.3277	20.3318	20.3194	20.3072	20.2990	20.2908	(88)
util rest of house	0.9167	0.8998	0.8653	0.7959	0.6861	0.5206	0.3742	0.4059	0.6109	0.8015	0.8886	0.9223	(89)
MIT 2	19.3599	18.6876	19.0517	19.5584	19.9467	20.2221	20.2995	20.2954	20.1374	19.6655	19.0460	18.7490	(90)
Living area fraction										fLA = Living area / (4) =		0.2917	(91)
MIT	19.5502	18.8577	19.2233	19.7306	20.1254	20.4057	20.4895	20.4831	20.3177	19.8364	19.2129	18.9211	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5502	18.8577	19.2233	19.7306	20.1254	20.4057	20.4895	20.4831	20.3177	19.8364	19.2129	18.9211	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9083	0.8788	0.8441	0.7784	0.6775	0.5262	0.3888	0.4196	0.6108	0.7848	0.8682	0.9063	(94)
Useful gains	711.0132	722.5970	722.3953	686.5196	603.4456	452.8987	320.7017	331.4288	464.8080	577.1733	637.5958	685.0619	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1422.1568	1293.7983	1172.2353	967.4899	747.9037	499.0818	334.3551	348.7077	541.4758	819.8998	1088.8297	1339.7907	(97)
Space heating kWh	529.0908	383.8473	334.6810	202.2986	107.4768	0.0000	0.0000	0.0000	0.0000	180.5886	324.8884	487.1183	(98a)
Space heating requirement - total per year (kWh/year)												2549.9898	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	529.0908	383.8473	334.6810	202.2986	107.4768	0.0000	0.0000	0.0000	0.0000	180.5886	324.8884	487.1183	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2549.9898	
Space heating per m2											(98c) / (4) =	21.2075	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (201)
Fraction of space heat from main system(s) 1.0000 (202)
Efficiency of main space heating system 1 (in %) 281.5100 (206)
Efficiency of main space heating system 2 (in %) 0.0000 (207)
Efficiency of secondary/supplementary heating system, % 0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	529.0908	383.8473	334.6810	202.2986	107.4768	0.0000	0.0000	0.0000	0.0000	180.5886	324.8884	487.1183	(98)
Space heating efficiency (main heating system 1)	281.5100	281.5100	281.5100	281.5100	281.5100	0.0000	0.0000	0.0000	0.0000	281.5100	281.5100	281.5100	(210)
Space heating fuel (main heating system)	187.9474	136.3530	118.8878	71.8620	38.1787	0.0000	0.0000	0.0000	0.0000	64.1500	115.4092	173.0376	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	283.1519	250.3096	265.5259	232.3519	224.5210	201.5227	198.2408	206.5027	209.2155	234.2546	250.2883	279.9007	(64)
Efficiency of water heater												279.7098	(216)
(217)m	279.7098	279.7098	279.7098	279.7098	279.7098	279.7098	279.7098	279.7098	279.7098	279.7098	279.7098	279.7098	(217)
Fuel for water heating, kWh/month	101.2306	89.4891	94.9291	83.0689	80.2693	72.0471	70.8737	73.8275	74.7973	83.7492	89.4814	100.0682	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	45.0156	40.6593	45.0156	43.5635	45.0156	43.5635	45.0156	45.0156	43.5635	45.0156	43.5635	45.0156	(231)
Lighting	36.7038	29.4451	26.5121	19.4239	15.0036	12.2580	13.6868	17.7906	23.1082	30.3192	34.2455	37.7239	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)

Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	905.8256	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	279.7098	
Water heating fuel used	1013.8315	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.3580)		
mechanical ventilation fans (SFP = 1.3580)	530.0227	(230a)
Total electricity for the above, kWh/year	530.0227	(231)
Electricity for lighting (calculated in Appendix L)	296.2206	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2745.9004	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	905.8256	16.4900	149.3706	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1013.8315	16.4900	167.1808	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	530.0227	16.4900	87.4007	(249)
Energy for lighting	296.2206	16.4900	48.8468	(250)
Additional standing charges			0.0000	(251)
Total energy cost			452.7990	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.9865	(257)
SAP value		84.0090	
SAP rating (Section 12)		84	(258)
SAP band		B	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	905.8256	0.1549	140.3139	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1013.8315	0.1410	142.9367	(264)
Space and water heating			283.2506	(265)
Pumps, fans and electric keep-hot	530.0227	0.1387	73.5207	(267)
Energy for lighting	296.2206	0.1443	42.7538	(268)
Total CO2, kg/year			399.5251	(272)
CO2 emissions per m2			3.3200	(273)
EI value			96.7601	
EI rating			97	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.0600	(1b) x	2.4800	(2b) =	116.7088	(1b) - (3b)
First floor	49.7800	(1c) x	2.7800	(2c) =	138.3884	(1c) - (3c)
Second floor	23.4000	(1d) x	2.7700	(2d) =	64.8180	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	120.2400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		319.9152	(5)

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2. Ventilation rate

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m3 per hour

Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.2500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2125	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.6000	4.5000	4.5000	4.1000	4.2000	3.7000	3.5000	3.5000	3.7000	4.1000	4.1000	4.2000	(22)
Wind factor	1.1500	1.1250	1.1250	1.0250	1.0500	0.9250	0.8750	0.8750	0.9250	1.0250	1.0250	1.0500	(22a)
Adj infilt rate	0.2444	0.2391	0.2391	0.2178	0.2231	0.1966	0.1859	0.1859	0.1966	0.2178	0.2178	0.2231	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =		80.1000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.3439	0.3386	0.3386	0.3173	0.3226	0.2961	0.2854	0.2854	0.2961	0.3173	0.3173	0.3226	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door			4.1400	1.0000	4.1400			(26)
Window			10.8700	0.7752	8.4264			(27)
GF			47.0600	0.0900	4.2354	75.0000	3529.5000	(28a)
Exposed Floor			2.7200	0.1400	0.3808	20.0000	54.4000	(28b)
Main	129.1100	15.0100	114.1000	0.1300	14.8330	9.0000	1026.9000	(29a)
Dwarf Wall (PIRx0.72)	16.7700		16.7700	0.0900	1.5093	9.0000	150.9300	(29a)
PIJ	15.5100		15.5100	0.1300	2.0163	9.0000	139.5900	(30)
PIR	17.5400		17.5400	0.1300	2.2802	9.0000	157.8600	(30)
Residual Ceiling	26.3800		26.3800	0.0900	2.3742	9.0000	237.4200	(30)
Total net area of external elements Aum(A, m2)			255.0900					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		40.1956			(33)
Main dwelling								
Party Wall 1			47.6000	0.0000	0.0000	20.0000	952.0000	(32)
Timber			124.1700			9.0000	1117.5300	(32c)
FF			47.0600			18.0000	847.0800	(32d)
SF			23.4000			18.0000	421.2000	(32d)
GF			47.0600			9.0000	423.5400	(32e)
FF			23.4000			9.0000	210.6000	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	9268.5500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		77.0837 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	10.6900	0.1150	1.2293
E3 Sill	10.6900	0.0170	0.1817
E4 Jamb	35.1000	0.0940	3.2994
E5 Ground floor (normal)	20.0500	0.0670	1.3434
E11 Eaves (insulation at rafter level)	18.1000	0.0250	0.4525
E16 Corner (normal)	24.0800	0.0680	1.6374
E12 Gable (insulation at ceiling level)	5.6600	0.0770	0.4358
E6 Intermediate floor within a dwelling	39.5500	0.0320	1.2656
E17 Corner (inverted - internal area greater than external area)	2.4800	-0.0290	-0.0719
P1 Party wall - Ground floor	9.0500	0.3200	2.8960
E20 Exposed floor (normal)	3.3800	0.0790	0.2670
E21 Exposed floor (inverted)	3.3800	0.0630	0.2129
E13 Gable (insulation at rafter level)	8.2800	0.0740	0.6127
E18 Party wall between dwellings	10.5200	0.0920	0.9678
R6 Flat ceiling	18.1000	-0.0430	-0.7783

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		13.9515 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	54.1470 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	36.3036	35.7427	35.7427	33.4993	34.0602	31.2559	30.1342	30.1342	31.2559	33.4993	33.4993	34.0602	(38)
Heat transfer coeff	90.4506	89.8898	89.8898	87.6464	88.2072	85.4030	84.2813	84.2813	85.4030	87.6464	87.6464	88.2072	(39)
Average = Sum(39)m / 12 =												87.4127	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7523	0.7476	0.7476	0.7289	0.7336	0.7103	0.7009	0.7009	0.7103	0.7289	0.7289	0.7336	(40)
HLP (average)												0.7270	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.8642 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
72.2437	71.1580	69.5759	66.5490	64.3151	61.8240	60.4080	61.9781	63.6992	66.3739	69.4659	71.9669	(42a)

Hot water usage for baths

31.1904	30.7271	30.0748	28.8721	27.9715	26.9729	26.4334	27.0812	27.7865	28.8550	30.0826	31.0849	(42b)

Hot water usage for other uses

43.9627	42.3640	40.7654	39.1667	37.5681	35.9694	35.9694	37.5681	39.1667	40.7654	42.3640	43.9627	(42c)

Average daily hot water use (litres/day)	135.4907 (43)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Daily hot water use

	147.3967	144.2491	140.4161	134.5878	129.8547	124.7663	122.8109	126.6274	130.6524	135.9943	141.9125	147.0144	(44)
Energy conte	233.4403	205.4088	215.8143	184.2439	174.8094	153.4147	148.5292	156.7911	161.1075	184.5430	202.1803	230.1891	(45)
Energy content (annual)										Total = Sum(45)m =		2250.4717	

Distribution loss (46)m = 0.15 x (45)m

	35.0160	30.8113	32.3722	27.6366	26.2214	23.0122	22.2794	23.5187	24.1661	27.6815	30.3271	34.5284	(46)

Water storage loss:

Store volume												210.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5800	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8532	(55)

Total storage loss

	26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(56)

If cylinder contains dedicated solar storage

	26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

	283.1519	250.3096	265.5259	232.3519	224.5210	201.5227	198.2408	206.5027	209.2155	234.2546	250.2883	279.9007	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

	283.1519	250.3096	265.5259	232.3519	224.5210	201.5227	198.2408	206.5027	209.2155	234.2546	250.2883	279.9007	(64)
										Total per year (kWh/year) = Sum(64)m =		2835.7857	(64)

Electric shower(s)

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)

Heat gains from water heating, kWh/month

	117.3882	104.2191	111.5276	99.7475	97.8934	89.4968	89.1552	91.9023	92.0546	101.1298	105.7114	116.3071	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	41.9331	37.2446	30.2893	22.9310	17.1412	14.4713	15.6368	20.3252	27.2805	34.6389	40.4287	43.0985	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	426.1571	430.5793	419.4356	395.7119	365.7649	337.6190	318.8159	314.3937	325.5374	349.2611	379.2081	407.3540	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	(71)

Water heating gains (Table 5)

	157.7798	155.0879	149.9026	138.5382	131.5771	124.3011	119.8323	123.5246	127.8537	135.9272	146.8213	156.3268	(72)

Total internal gains

	738.2044	735.2462	711.9619	669.5154	626.8177	588.7258	566.6193	570.5780	593.0060	632.1616	678.7925	719.1137	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	2.2600	8.9975	0.3000	0.0000	0.7700	4.6972	(74)
East	5.8000	16.6187	0.3000	0.0000	0.7700	22.2657	(76)
West	2.8100	16.6187	0.3000	0.0000	0.7700	10.7874	(80)

Solar gains	37.7503	77.3544	134.8795	202.5762	246.0666	258.4136	240.4401	201.0789	159.2694	95.4753	48.8209	33.2510	(83)
Total gains	775.9547	812.6006	846.8414	872.0917	872.8842	847.1394	807.0594	771.6569	752.2754	727.6369	727.6134	752.3647	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	28.4641	28.6417	28.6417	29.3748	29.1881	30.1465	30.5477	30.5477	30.1465	29.3748	29.3748	29.1881	
alpha	2.8976	2.9094	2.9094	2.9583	2.9459	3.0098	3.0365	3.0365	3.0098	2.9583	2.9583	2.9459	
util living area	0.9197	0.9037	0.8740	0.8044	0.6967	0.5442	0.4350	0.4608	0.6530	0.8184	0.8930	0.9243	(86)
Living	19.2188	19.4116	19.7205	20.2328	20.6237	20.8771	20.9526	20.9432	20.7657	20.2933	19.7369	19.2254	
Non living	18.6488	18.8405	19.1422	19.6483	20.0095	20.2471	20.3128	20.3068	20.1568	19.7118	19.1740	18.6670	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.0888	19.4116	19.7205	20.2328	20.6237	20.8771	20.9526	20.9432	20.7657	20.2933	19.7369	19.4736	(87)
Th 2	20.2949	20.2990	20.2990	20.3153	20.3113	20.3318	20.3400	20.3400	20.3318	20.3153	20.3153	20.3113	(88)
util rest of house	0.9118	0.8943	0.8614	0.7840	0.6633	0.4957	0.3766	0.4015	0.6101	0.7959	0.8812	0.9169	(89)
MIT 2	19.4528	18.8405	19.1422	19.6483	20.0095	20.2471	20.3128	20.3068	20.1568	19.7118	19.1740	18.8970	(90)
Living area fraction										fLA = Living area / (4) =		0.2917	(91)
MIT	19.6384	19.0071	19.3109	19.8188	20.1887	20.4309	20.4995	20.4925	20.3345	19.8815	19.3382	19.0652	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6384	19.0071	19.3109	19.8188	20.1887	20.4309	20.4995	20.4925	20.3345	19.8815	19.3382	19.0652	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9036	0.8738	0.8408	0.7677	0.6569	0.5031	0.3910	0.4156	0.6103	0.7799	0.8614	0.9011	(94)
Useful gains	701.1191	710.0351	712.0374	669.5449	573.4061	426.2115	315.5740	320.6696	459.1239	567.4532	626.7895	677.9801	(95)
Ext temp.	4.7000	5.3000	6.7000	9.3000	12.3000	15.0000	16.6000	16.5000	14.1000	10.8000	7.5000	4.6000	(96)
Heat loss rate W	1351.1843	1232.1310	1133.5944	921.9377	695.8431	463.8130	328.6537	336.4889	532.4409	795.9568	1037.5746	1275.9386	(97)

Space heating kWh													
	483.6484	350.8485	313.6384	181.7228	91.0931	0.0000	0.0000	0.0000	0.0000	170.0067	295.7653	444.8811	(98a)
Space heating requirement - total per year (kWh/year)												2331.6043	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	483.6484	350.8485	313.6384	181.7228	91.0931	0.0000	0.0000	0.0000	0.0000	170.0067	295.7653	444.8811	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2331.6043	
Space heating per m2											(98c) / (4) =	19.3913	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												280.6526	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	483.6484	350.8485	313.6384	181.7228	91.0931	0.0000	0.0000	0.0000	0.0000	170.0067	295.7653	444.8811	(98)
Space heating efficiency (main heating system 1)													
	280.6526	280.6526	280.6526	280.6526	280.6526	0.0000	0.0000	0.0000	0.0000	280.6526	280.6526	280.6526	(210)
Space heating fuel (main heating system)													
	172.3299	125.0117	111.7533	64.7501	32.4576	0.0000	0.0000	0.0000	0.0000	60.5755	105.3849	158.5167	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	283.1519	250.3096	265.5259	232.3519	224.5210	201.5227	198.2408	206.5027	209.2155	234.2546	250.2883	279.9007	(64)
Efficiency of water heater												279.7181	(216)
(217)m	279.7181	279.7181	279.7181	279.7181	279.7181	279.7181	279.7181	279.7181	279.7181	279.7181	279.7181	279.7181	(217)
Fuel for water heating, kWh/month													
	101.2276	89.4864	94.9263	83.0665	80.2669	72.0449	70.8716	73.8253	74.7951	83.7467	89.4788	100.0653	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	45.0156	40.6593	45.0156	43.5635	45.0156	43.5635	45.0156	45.0156	43.5635	45.0156	43.5635	45.0156	(231)
Lighting	36.7038	29.4451	26.5121	19.4239	15.0036	12.2580	13.6868	17.7906	23.1082	30.3192	34.2455	37.7239	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												830.7796	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												279.7181	
Water heating fuel used												1013.8013	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.3580)													
mechanical ventilation fans (SFP = 1.3580)												530.0227	(230a)
Total electricity for the above, kWh/year												530.0227	(231)
Electricity for lighting (calculated in Appendix L)												296.2206	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												2670.8241	(238)

10a. Fuel costs - using BEDF prices (583)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	830.7796	28.4300	236.1906	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1013.8013	28.4300	288.2237	(247)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(247a)
Pumps, fans and electric keep-hot	530.0227	28.4300	150.6855	(249)
Energy for lighting	296.2206	28.4300	84.2155	(250)
Additional standing charges			0.0000	(251)
Total energy cost			759.3153	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	830.7796	0.1549	128.7232	(261)

Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1013.8013	0.1410	142.9324 (264)
Space and water heating			271.6556 (265)
Pumps, fans and electric keep-hot	530.0227	0.1387	73.5207 (267)
Energy for lighting	296.2206	0.1443	42.7538 (268)
Total CO2, kg/year			387.9301 (272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	830.7796	1.5736	1307.3332 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1013.8013	1.5213	1542.3180 (278)
Space and water heating			2849.6512 (279)
Pumps, fans and electric keep-hot	530.0227	1.5128	801.8183 (281)
Energy for lighting	296.2206	1.5338	454.3530 (282)
Total Primary energy kWh/year			4105.8226 (286)

SAP 10 EPC IMPROVEMENTS

001

Current energy efficiency rating: B 84
Current environmental impact rating: A 97

N Solar water heating			Recommended
U Solar photovoltaic panels			Recommended
V2 Wind turbine			Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
N Solar water heating	+ 1.2	-£ 54	-23 kg (6.0%)
U Solar photovoltaic panels	+ 6.9	-£ 289	-207 kg (56.8%)

	Typical annual savings		Energy efficiency	Environmental impact
Recommended measures				
Solar water heating	£54	0.19 kg/m²	B 85	A 97
Solar photovoltaic panels	£289	1.72 kg/m²	A 92	A 99
Total Savings	£342	1.91 kg/m²		

Potential energy efficiency rating: A 92
Potential environmental impact rating: A 99

Fuel prices for cost data on this page from database revision number 583 TEST (01 Oct 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, West Pennines (England)):

	Current	Potential	Saving
Electricity	£759	£706	£54
Space heating	£387	£413	-£26
Water heating	£288	£209	£79
Lighting	£84	£84	£0
Generated (PV)	-£0	-£289	£289
Total cost of fuels	£759	£417	£343
Total cost of uses	£759	£417	£342
Delivered energy	22 kWh/m²	7 kWh/m²	15 kWh/m²
Carbon dioxide emissions	0.4 tonnes	0.2 tonnes	0.2 tonnes
CO2 emissions per m²	3 kg/m²	1 kg/m²	2 kg/m²
Primary energy	34 kWh/m²	18 kWh/m²	16 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

1. Overall dwelling characteristics

Main dwelling	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	47.0600 (1b)	x	2.4800 (2b)	=	116.7088 (1b) - (3b)	
First floor	49.7800 (1c)	x	2.7800 (2c)	=	138.3884 (1c) - (3c)	
Second floor	23.4000 (1d)	x	2.7700 (2d)	=	64.8180 (1d) - (3d)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	120.2400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	319.9152	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)

Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.2500 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2125 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2709	0.2656	0.2603	0.2338	0.2284	0.2019	0.2019	0.1966	0.2125	0.2284	0.2391	0.2497	(22b)

Balanced mechanical ventilation with heat recovery		
If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =		80.1000 (23c)

Effective ac	0.3704	0.3651	0.3598	0.3332	0.3279	0.3014	0.3014	0.2961	0.3120	0.3279	0.3386	0.3492	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Door			4.1400	1.0000	4.1400			(26)
Window			10.8700	0.7752	8.4264			(27)
GF			47.0600	0.0900	4.2354	75.0000	3529.5000	(28a)
Exposed Floor			2.7200	0.1400	0.3808	20.0000	54.4000	(28b)
Main	129.1100	15.0100	114.1000	0.1300	14.8330	9.0000	1026.9000	(29a)
Dwarf Wall (PIRx0.72)	16.7700		16.7700	0.0900	1.5093	9.0000	150.9300	(29a)
PIJ	15.5100		15.5100	0.1300	2.0163	9.0000	139.5900	(30)
PIR	17.5400		17.5400	0.1300	2.2802	9.0000	157.8600	(30)
Residual Ceiling	26.3800		26.3800	0.0900	2.3742	9.0000	237.4200	(30)
Total net area of external elements Aum(A, m2)			255.0900					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		40.1956			(33)
Main dwelling								
Party Wall 1			47.6000	0.0000	0.0000	20.0000	952.0000	(32)
Timber			124.1700			9.0000	1117.5300	(32c)
FF			47.0600			18.0000	847.0800	(32d)
SF			23.4000			18.0000	421.2000	(32d)
GF			47.0600			9.0000	423.5400	(32e)
FF			23.4000			9.0000	210.6000	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	9268.5500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		77.0837 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	10.6900	0.1150	1.2293
E3 Sill	10.6900	0.0170	0.1817
E4 Jamb	35.1000	0.0940	3.2994
E5 Ground floor (normal)	20.0500	0.0670	1.3434
E11 Eaves (insulation at rafter level)	18.1000	0.0250	0.4525
E16 Corner (normal)	24.0800	0.0680	1.6374
E12 Gable (insulation at ceiling level)	5.6600	0.0770	0.4358
E6 Intermediate floor within a dwelling	39.5500	0.0320	1.2656
E17 Corner (inverted - internal area greater than external area)	2.4800	-0.0290	-0.0719
P1 Party wall - Ground floor	9.0500	0.3200	2.8960
E20 Exposed floor (normal)	3.3800	0.0790	0.2670
E21 Exposed floor (inverted)	3.3800	0.0630	0.2129
E13 Gable (insulation at rafter level)	8.2800	0.0740	0.6127
E18 Party wall between dwellings	10.5200	0.0920	0.9678
R6 Flat ceiling	18.1000	-0.0430	-0.7783

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		13.9515 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	54.1470 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	39.1078	38.5470	37.9861	35.1819	34.6210	31.8168	31.8168	31.2559	32.9385	34.6210	35.7427	36.8644	(38)
Heat transfer coeff	93.2549	92.6940	92.1332	89.3289	88.7681	85.9638	85.9638	85.4030	87.0855	88.7681	89.8898	91.0115	(39)
Average = Sum(39)m / 12 =												89.1887	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7756	0.7709	0.7662	0.7429	0.7383	0.7149	0.7149	0.7103	0.7243	0.7383	0.7476	0.7569	(40)
HLP (average)												0.7418	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.8642 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	72.2437	71.1580	69.5759	66.5490	64.3151	61.8240	60.4080	61.9781	63.6992	66.3739	69.4659	71.9669	(42a)
Hot water usage for baths	31.1904	30.7271	30.0748	28.8721	27.9715	26.9729	26.4334	27.0812	27.7865	28.8550	30.0826	31.0849	(42b)
Hot water usage for other uses	43.9627	42.3640	40.7654	39.1667	37.5681	35.9694	35.9694	37.5681	39.1667	40.7654	42.3640	43.9627	(42c)
Average daily hot water use (litres/day)												135.4907	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	147.3967	144.2491	140.4161	134.5878	129.8547	124.7663	122.8109	126.6274	130.6524	135.9943	141.9125	147.0144	(44)
Energy conte	233.4403	205.4088	215.8143	184.2439	174.8094	153.4147	148.5292	156.7911	161.1075	184.5430	202.1803	230.1891	(45)
Energy content (annual)										Total = Sum(45)m =		2250.4717	

Distribution loss (46)m = 0.15 x (45)m

	35.0160	30.8113	32.3722	27.6366	26.2214	23.0122	22.2794	23.5187	24.1661	27.6815	30.3271	34.5284 (46)

Water storage loss:

Store volume	210.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):	1.5800 (48)
Temperature factor from Table 2b	0.5400 (49)
Enter (49) or (54) in (55)	0.8532 (55)

Total storage loss

	26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492 (56)

If cylinder contains dedicated solar storage

	17.0031	15.3576	17.0031	16.4546	17.0031	16.4546	17.0031	17.0031	16.4546	17.0031	16.4546	17.0031 (57)
Primary loss	23.2624	21.0112	21.8667	15.7584	10.4681	9.9053	10.2355	11.1660	17.1091	21.8667	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)

Total heat required for water heating calculated for each month

	273.7058	241.7776	254.6841	216.4569	202.2805	179.7746	175.7677	184.9602	194.6712	223.4127	241.1469	270.4545 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)

Aperture area of solar collector	3.0000 (H1)
Zero-loss collector efficiency	0.8000 (H2)
Collector linear heat loss coefficient	1.8000 (H3)
Collector 2nd order heat loss coefficient	0.0000 (H4)
Collector loop efficiency	0.9000 (H5)
Incidence angle modifier	1.0000 (H6)
Overshading factor	0.8000 (H8)
Overall heat loss coefficient of system	6.5000 (H10)
Heat loss coefficient of collector loop	3.9667 (H11)
Dedicated solar storage volume	75.0000 (H12)
If combined cylinder, total volume of cylinder	210.0000 (H13)
Effective solar volume	115.5000 (H14)
Reference volume	225.0000 (H15)
Storage tank correction coefficient	1.1814 (H16)
Heat delivered to hot water	661.7243 (H24)
Heat delivered to space heating	0.0000 (H29)
Solar input	661.7243

Solar input	-0.0000	-20.2144	-62.8139	-84.6635	-109.0628	-100.4582	-99.7212	-87.9174	-62.1691	-33.3828	-1.3210	-0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)

Output from w/h

	273.7058	221.5632	191.8702	131.7934	93.2177	79.3164	76.0465	97.0428	132.5020	190.0299	239.8259	270.4545 (64)

Total per year (kWh/year) = Sum(64)m = 1997.3683 (64)

Electric shower(s)

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

	109.8313	97.3935	102.8540	87.0315	80.1010	72.0983	71.1768	74.6683	80.4192	92.4563	98.3982	108.7502 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	41.9331	37.2446	30.2893	22.9310	17.1412	14.4713	15.6368	20.3252	27.2805	34.6389	40.4287	43.0985 (67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	426.1571	430.5793	419.4356	395.7119	365.7649	337.6190	318.8159	314.3937	325.5374	349.2611	379.2081	407.3540 (68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)

Losses e.g. evaporation (negative values) (Table 5)

	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695 (71)

Water heating gains (Table 5)

	147.6227	144.9308	138.2447	120.8771	107.6627	100.1365	95.6677	100.3606	111.6933	124.2693	136.6642	146.1697 (72)

Total internal gains

	728.0473	725.0891	700.3040	651.8543	602.9032	564.5612	542.4547	547.4139	576.8456	620.5037	668.6353	708.9566 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	2.2600	10.6334	0.3000	0.0000	0.7700	5.5513	(74)
East	5.8000	19.6403	0.3000	0.0000	0.7700	26.3140	(76)
West	2.8100	19.6403	0.3000	0.0000	0.7700	12.7487	(80)

Solar gains	44.6140	87.0237	143.8714	212.4926	263.9373	272.0143	258.1998	219.2319	168.0366	103.3011	55.5548	36.7511	(83)
Total gains	772.6613	812.1128	844.1754	864.3469	866.8405	836.5755	800.6545	766.6458	744.8822	723.8048	724.1901	745.7076	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	27.6082	27.7752	27.9443	28.8215	29.0036	29.9498	29.9498	30.1465	29.5640	29.0036	28.6417	28.2887	
alpha	2.8405	2.8517	2.8630	2.9214	2.9336	2.9967	2.9967	3.0098	2.9709	2.9336	2.9094	2.8859	
util living area	0.9262	0.9111	0.8809	0.8214	0.7273	0.5787	0.4447	0.4766	0.6631	0.8283	0.9024	0.9313	(86)
Living	19.0509	19.2537	19.6223	20.1277	20.5401	20.8426	20.9471	20.9343	20.7463	20.2370	19.6016	19.0504	
Non living	18.4691	18.6710	19.0349	19.5389	19.9303	20.2155	20.2974	20.2928	20.1299	19.6524	19.0300	18.4802	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.0029	19.2537	19.6223	20.1277	20.5401	20.8426	20.9471	20.9343	20.7463	20.2370	19.6016	19.3231	(87)
Th 2	20.2746	20.2786	20.2827	20.3031	20.3072	20.3277	20.3277	20.3318	20.3194	20.3072	20.2990	20.2908	(88)
util rest of house	0.9189	0.9023	0.8687	0.8026	0.6970	0.5323	0.3844	0.4167	0.6199	0.8067	0.8916	0.9245	(89)
MIT 2	19.3510	18.6710	19.0349	19.5389	19.9303	20.2155	20.2974	20.2928	20.1299	19.6524	19.0300	18.7335	(90)
Living area fraction									fLA = Living area / (4) =			0.2917	(91)
MIT	19.5412	18.8410	19.2063	19.7107	20.1082	20.3985	20.4870	20.4799	20.3097	19.8229	19.1968	18.9055	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5412	18.8410	19.2063	19.7107	20.1082	20.3985	20.4870	20.4799	20.3097	19.8229	19.1968	18.9055	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9106	0.8814	0.8475	0.7847	0.6876	0.5374	0.3990	0.4304	0.6192	0.7897	0.8714	0.9087	(94)
Useful gains	703.5786	715.7796	715.4460	678.2649	596.0616	449.6028	319.4996	329.9475	461.2473	571.6146	631.0461	677.6345	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1421.3135	1292.2514	1170.6722	965.7081	746.3835	498.4609	334.1374	348.4387	540.7747	818.7031	1087.3762	1338.3705	(97)
Space heating kWh	533.9948	387.3890	338.6883	206.9591	111.8395	0.0000	0.0000	0.0000	0.0000	183.8338	328.5577	491.5876	(98a)
Space heating requirement - total per year (kWh/year)												2582.8497	
Solar heating kWh	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	533.9948	387.3890	338.6883	206.9591	111.8395	0.0000	0.0000	0.0000	0.0000	183.8338	328.5577	491.5876	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2582.8497	
Space heating per m2											(98c) / (4) =	21.4808	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	281.5100	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	533.9948	387.3890	338.6883	206.9591	111.8395	0.0000	0.0000	0.0000	0.0000	183.8338	328.5577	491.5876	(98)
Space heating efficiency (main heating system 1)	281.5100	281.5100	281.5100	281.5100	281.5100	0.0000	0.0000	0.0000	0.0000	281.5100	281.5100	281.5100	(210)
Space heating fuel (main heating system)	189.6894	137.6111	120.3113	73.5175	39.7284	0.0000	0.0000	0.0000	0.0000	65.3028	116.7126	174.6253	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	273.7058	221.5632	191.8702	131.7934	93.2177	79.3164	76.0465	97.0428	132.5020	190.0299	239.8259	270.4545	(64)
Efficiency of water heater												279.7098	(216)
(217)m	279.7098	279.7098	279.7098	279.7098	279.7098	279.7098	279.7098	279.7098	279.7098	279.7098	279.7098	279.7098	(217)
Fuel for water heating, kWh/month	97.8535	79.2118	68.5962	47.1179	33.3266	28.3567	27.1876	34.6941	47.3713	67.9383	85.7410	96.6911	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	51.8101	46.7963	51.8101	50.1389	51.8101	50.1389	51.8101	51.8101	50.1389	51.8101	50.1389	51.8101	(231)
Lighting	36.7038	29.4451	26.5121	19.4239	15.0036	12.2580	13.6868	17.7906	23.1082	30.3192	34.2455	37.7239	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-38.4395	-57.4193	-86.9110	-101.3697	-110.7762	-101.0540	-99.8755	-93.0740	-80.9490	-66.7889	-43.0872	-32.7450	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-11.6470	-26.1607	-55.4353	-89.4023	-124.9066	-130.6597	-128.7761	-106.7000	-75.5141	-40.0570	-16.3226	-9.1689	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	917.4984	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	279.7098	
Water heating fuel used	714.0860	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.3580)		
mechanical ventilation fans (SFP = 1.3580)	530.0227	(230a)
pump for solar water heating	80.0000	(230g)
Total electricity for the above, kWh/year	610.0227	(231)
Electricity for lighting (calculated in Appendix L)	296.2206	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1727.2394	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	810.5882	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	917.4984	16.4900	151.2955	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	714.0860	16.4900	117.7528	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)

Pumps, fans and electric keep-hot	530.0227	16.4900	87.4007	(249)
Pump for solar water heating	80.0000	16.4900	13.1920	(249)
Energy for lighting	296.2206	16.4900	48.8468	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-912.4892	16.4900	-150.4695	
PV Unit electricity exported	-814.7502	5.5900	-45.5445	
Total			-196.0140	(252)
Total energy cost			222.4738	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.4847	(257)
SAP value		92.1431	
SAP rating (Section 12)		92	(258)
SAP band		A	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	917.4984	0.1548	142.0706	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	714.0860	0.1460	104.2890	(264)
Space and water heating			246.3596	(265)
Pumps, fans and electric keep-hot	610.0227	0.1387	84.6177	(267)
Energy for lighting	296.2206	0.1443	42.7538	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-912.4892	0.1340	-122.3080	
PV Unit electricity exported	-814.7502	0.1237	-100.7656	
Total			-223.0737	(269)
Total CO2, kg/year			150.6574	(272)
CO2 emissions per m2			1.2500	(273)
EI value			98.7783	
EI rating			99	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

Main dwelling	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	47.0600	(1b) x	2.4800	(2b) =	116.7088	(1b) - (3b)
First floor	49.7800	(1c) x	2.7800	(2c) =	138.3884	(1c) - (3c)
Second floor	23.4000	(1d) x	2.7700	(2d) =	64.8180	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	120.2400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		319.9152	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.2500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2125	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.6000	4.5000	4.5000	4.1000	4.2000	3.7000	3.5000	3.5000	3.7000	4.1000	4.1000	4.2000	(22)
Wind factor	1.1500	1.1250	1.1250	1.0250	1.0500	0.9250	0.8750	0.8750	0.9250	1.0250	1.0250	1.0500	(22a)
Adj infilt rate	0.2444	0.2391	0.2391	0.2178	0.2231	0.1966	0.1859	0.1859	0.1966	0.2178	0.2178	0.2231	(22b)

Balanced mechanical ventilation with heat recovery		
If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =		80.1000 (23c)

Effective ac	0.3439	0.3386	0.3386	0.3173	0.3226	0.2961	0.2854	0.2854	0.2961	0.3173	0.3173	0.3226 (25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Door			4.1400	1.0000	4.1400			(26)
Window			10.8700	0.7752	8.4264			(27)
GF			47.0600	0.0900	4.2354	75.0000	3529.5000	(28a)
Exposed Floor			2.7200	0.1400	0.3808	20.0000	54.4000	(28b)
Main	129.1100	15.0100	114.1000	0.1300	14.8330	9.0000	1026.9000	(29a)
Dwarf Wall (PIRx0.72)	16.7700		16.7700	0.0900	1.5093	9.0000	150.9300	(29a)
PIJ	15.5100		15.5100	0.1300	2.0163	9.0000	139.5900	(30)
PIR	17.5400		17.5400	0.1300	2.2802	9.0000	157.8600	(30)
Residual Ceiling	26.3800		26.3800	0.0900	2.3742	9.0000	237.4200	(30)
Total net area of external elements Aum(A, m2)			255.0900					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		40.1956			(33)
Main dwelling								
Party Wall 1			47.6000	0.0000	0.0000	20.0000	952.0000	(32)
Timber			124.1700			9.0000	1117.5300	(32c)
FF			47.0600			18.0000	847.0800	(32d)
SF			23.4000			18.0000	421.2000	(32d)
GF			47.0600			9.0000	423.5400	(32e)
FF			23.4000			9.0000	210.6000	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	9268.5500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		77.0837 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	10.6900	0.1150	1.2293
E3 Sill	10.6900	0.0170	0.1817
E4 Jamb	35.1000	0.0940	3.2994
E5 Ground floor (normal)	20.0500	0.0670	1.3434
E11 Eaves (insulation at rafter level)	18.1000	0.0250	0.4525
E16 Corner (normal)	24.0800	0.0680	1.6374
E12 Gable (insulation at ceiling level)	5.6600	0.0770	0.4358
E6 Intermediate floor within a dwelling	39.5500	0.0320	1.2656
E17 Corner (inverted - internal area greater than external area)	2.4800	-0.0290	-0.0719
P1 Party wall - Ground floor	9.0500	0.3200	2.8960
E20 Exposed floor (normal)	3.3800	0.0790	0.2670
E21 Exposed floor (inverted)	3.3800	0.0630	0.2129
E13 Gable (insulation at rafter level)	8.2800	0.0740	0.6127
E18 Party wall between dwellings	10.5200	0.0920	0.9678
R6 Flat ceiling	18.1000	-0.0430	-0.7783

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		13.9515 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	54.1470 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	36.3036	35.7427	35.7427	33.4993	34.0602	31.2559	30.1342	30.1342	31.2559	33.4993	33.4993	34.0602	(38)
Heat transfer coeff	90.4506	89.8898	89.8898	87.6464	88.2072	85.4030	84.2813	84.2813	85.4030	87.6464	87.6464	88.2072	(39)
Average = Sum(39)m / 12 =												87.4127	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7523	0.7476	0.7476	0.7289	0.7336	0.7103	0.7009	0.7009	0.7103	0.7289	0.7289	0.7336	(40)
HLP (average)												0.7270	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.8642 (42)
Hot water usage for mixer showers	72.2437	71.1580	69.5759	66.5490	64.3151	61.8240	60.4080	61.9781	63.6992	66.3739	69.4659	71.9669 (42a)
Hot water usage for baths	31.1904	30.7271	30.0748	28.8721	27.9715	26.9729	26.4334	27.0812	27.7865	28.8550	30.0826	31.0849 (42b)
Hot water usage for other uses	43.9627	42.3640	40.7654	39.1667	37.5681	35.9694	35.9694	37.5681	39.1667	40.7654	42.3640	43.9627 (42c)
Average daily hot water use (litres/day)												135.4907 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	147.3967	144.2491	140.4161	134.5878	129.8547	124.7663	122.8109	126.6274	130.6524	135.9943	141.9125	147.0144	(44)
Energy conte	233.4403	205.4088	215.8143	184.2439	174.8094	153.4147	148.5292	156.7911	161.1075	184.5430	202.1803	230.1891	(45)
Energy content (annual)										Total = Sum(45)m =		2250.4717	
Distribution loss (46)m = 0.15 x (45)m	35.0160	30.8113	32.3722	27.6366	26.2214	23.0122	22.2794	23.5187	24.1661	27.6815	30.3271	34.5284	(46)
Water storage loss:													
Store volume												210.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5800	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8532	(55)
Total storage loss	26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(56)
If cylinder contains dedicated solar storage	17.0031	15.3576	17.0031	16.4546	17.0031	16.4546	17.0031	17.0031	16.4546	17.0031	16.4546	17.0031	(57)
Primary loss	23.2624	21.0112	21.8667	15.7584	10.4681	9.9053	10.2355	11.1660	17.1091	21.8667	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	273.7058	241.7776	254.6841	216.4569	202.2805	179.7746	175.7677	184.9602	194.6712	223.4127	241.1469	270.4545	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Aperture area of solar collector												3.0000	(H1)
Zero-loss collector efficiency												0.8000	(H2)
Collector linear heat loss coefficient												1.8000	(H3)
Collector 2nd order heat loss coefficient												0.0000	(H4)
Collector loop efficiency												0.9000	(H5)
Incidence angle modifier												1.0000	(H6)
Overshading factor												0.8000	(H8)
Overall heat loss coefficient of system												6.5000	(H10)
Heat loss coefficient of collector loop												3.9667	(H11)
Dedicated solar storage volume												75.0000	(H12)
If combined cylinder, total volume of cylinder												210.0000	(H13)

Effective solar volume												115.5000	(H14)
Reference volume												225.0000	(H15)
Storage tank correction coefficient												1.1814	(H16)
Heat delivered to hot water												605.2985	(H24)
Heat delivered to space heating												0.0000	(H29)
Solar input												605.2985	
Solar input	-0.0000	-14.4753	-57.1346	-80.0537	-101.5431	-95.3649	-92.1367	-79.1730	-57.3788	-28.0385	-0.0000	-0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	273.7058	227.3023	197.5495	136.4032	100.7374	84.4097	83.6309	105.7872	137.2924	195.3743	241.1469	270.4545	(64)
									Total per year (kWh/year) = Sum(64)m =			2053.7941	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month													
	109.8313	97.3935	102.8540	87.0315	80.1010	72.0983	71.1768	74.6683	80.4192	92.4563	98.3982	108.7502	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	41.9331	37.2446	30.2893	22.9310	17.1412	14.4713	15.6368	20.3252	27.2805	34.6389	40.4287	43.0985	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	426.1571	430.5793	419.4356	395.7119	365.7649	337.6190	318.8159	314.3937	325.5374	349.2611	379.2081	407.3540	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	(71)
Water heating gains (Table 5)													
	147.6227	144.9308	138.2447	120.8771	107.6627	100.1365	95.6677	100.3606	111.6933	124.2693	136.6642	146.1697	(72)
Total internal gains													
	728.0473	725.0891	700.3040	651.8543	602.9032	564.5612	542.4547	547.4139	576.8456	620.5037	668.6353	708.9566	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	2.2600	8.9975	0.3000	0.0000	0.7700	4.6972	(74)
East	5.8000	16.6187	0.3000	0.0000	0.7700	22.2657	(76)
West	2.8100	16.6187	0.3000	0.0000	0.7700	10.7874	(80)

Solar gains	37.7503	77.3544	134.8795	202.5762	246.0666	258.4136	240.4401	201.0789	159.2694	95.4753	48.8209	33.2510	(83)
Total gains	765.7976	802.4435	835.1835	854.4305	848.9697	822.9748	782.8947	748.4928	736.1151	715.9789	717.4562	742.2075	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	28.4641	28.6417	28.6417	29.3748	29.1881	30.1465	30.5477	30.5477	30.1465	29.3748	29.3748	29.1881	
alpha	2.8976	2.9094	2.9094	2.9583	2.9459	3.0098	3.0365	3.0365	3.0098	2.9583	2.9583	2.9459	
util living area													
	0.9219	0.9062	0.8774	0.8110	0.7077	0.5563	0.4466	0.4728	0.6620	0.8235	0.8960	0.9265	(86)
Living	19.2010	19.3947	19.7031	20.2126	20.6065	20.8695	20.9491	20.9391	20.7564	20.2792	19.7205	19.2071	
Non living	18.6314	18.8242	19.1257	19.6297	19.9949	20.2415	20.3107	20.3042	20.1494	19.6990	19.1583	18.6492	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.0797	19.3947	19.7031	20.2126	20.6065	20.8695	20.9491	20.9391	20.7564	20.2792	19.7205	19.4579	(87)
Th 2	20.2949	20.2990	20.2990	20.3153	20.3113	20.3318	20.3400	20.3400	20.3318	20.3153	20.3153	20.3113	(88)
util rest of house													
	0.9142	0.8970	0.8650	0.7910	0.6746	0.5074	0.3870	0.4125	0.6193	0.8012	0.8845	0.9193	(89)
MIT 2	19.4439	18.8242	19.1257	19.6297	19.9949	20.2415	20.3107	20.3042	20.1494	19.6990	19.1583	18.8817	(90)
Living area fraction										fLA = Living area / (4) =		0.2917	(91)
MIT	19.6294	18.9907	19.2941	19.7998	20.1733	20.4247	20.4970	20.4894	20.3265	19.8683	19.3224	19.0498	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6294	18.9907	19.2941	19.7998	20.1733	20.4247	20.4970	20.4894	20.3265	19.8683	19.3224	19.0498	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9060	0.8765	0.8444	0.7744	0.6675	0.5145	0.4016	0.4265	0.6189	0.7850	0.8648	0.9037	(94)
Useful gains	693.8319	703.3641	705.2016	661.6692	566.7049	423.3809	314.3811	319.2596	455.6169	562.0192	620.4204	670.7102	(95)
Ext temp.	4.7000	5.3000	6.7000	9.3000	12.3000	15.0000	16.6000	16.5000	14.1000	10.8000	7.5000	4.6000	(96)
Heat loss rate W													
	1350.3740	1230.6497	1132.0843	920.2677	694.4826	463.2867	328.4402	336.2352	531.7601	794.7997	1036.1874	1274.5773	(97)
Space heating kWh													
	488.4673	354.3359	317.6007	186.1909	95.0667	0.0000	0.0000	0.0000	0.0000	173.1887	299.3522	449.2771	(98a)
Space heating requirement - total per year (kWh/year)												2363.4796	
Solar heating kWh													
	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	488.4673	354.3359	317.6007	186.1909	95.0667	0.0000	0.0000	0.0000	0.0000	173.1887	299.3522	449.2771	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2363.4796	
Space heating per m2											(98c) / (4) =	19.6564	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												280.6526	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	488.4673	354.3359	317.6007	186.1909	95.0667	0.0000	0.0000	0.0000	0.0000	173.1887	299.3522	449.2771	(98)
Space heating efficiency (main heating system 1)													
	280.6526	280.6526	280.6526	280.6526	280.6526	0.0000	0.0000	0.0000	0.0000	280.6526	280.6526	280.6526	(210)
Space heating fuel (main heating system)													
	174.0470	126.2543	113.1651	66.3421	33.8734	0.0000	0.0000	0.0000	0.0000	61.7093	106.6629	160.0830	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	273.7058	227.3023	197.5495	136.4032	100.7374	84.4097	83.6309	105.7872	137.2924	195.3743	241.1469	270.4545	(64)
Efficiency of water heater												279.7181	(216)
(217)m	279.7181	279.7181	279.7181	279.7181	279.7181	279.7181	279.7181	279.7181	279.7181	279.7181	279.7181	279.7181	(217)
Fuel for water heating, kWh/month													
	97.8506	81.2612	70.6245	48.7645	36.0139	30.1767	29.8983	37.8192	49.0824	69.8468	86.2107	96.6882	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	51.8101	46.7963	51.8101	50.1389	51.8101	50.1389	51.8101	51.8101	50.1389	51.8101	50.1389	51.8101	(231)
Lighting	36.7038	29.4451	26.5121	19.4239	15.0036	12.2580	13.6868	17.7906	23.1082	30.3192	34.2455	37.7239	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-33.1456	-52.0231	-82.6198	-97.7753	-105.7648	-98.2936	-96.1046	-88.5186	-78.2206	-62.8346	-38.5501	-29.9155	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-9.2352	-22.2702	-50.8298	-84.0940	-113.9603	-121.8344	-116.8196	-94.7136	-70.0792	-35.9169	-13.6585	-8.0065	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												842.1372	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												279.7181	
Water heating fuel used												734.2371	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.3580)													
mechanical ventilation fans (SFP = 1.3580)												530.0227	(230a)
pump for solar water heating												80.0000	(230g)
Total electricity for the above, kWh/year												610.0227	(231)
Electricity for lighting (calculated in Appendix L)												296.2206	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1605.1846	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												877.4329	(238)

10a. Fuel costs - using BEDF prices (583)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	842.1372	28.4300	239.4196	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	734.2371	28.4300	208.7436	(247)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(247a)
Pumps, fans and electric keep-hot	530.0227	28.4300	150.6855	(249)
Pump for solar water heating	80.0000	28.4300	22.7440	(249)
Energy for lighting	296.2206	28.4300	84.2155	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-863.7662	28.4300	-245.5687	
PV Unit electricity exported	-741.4183	5.8100	-43.0764	
Total			-288.6452	(252)
Total energy cost			417.1630	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	842.1372	0.1549	130.4349	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	734.2371	0.1456	106.9250	(264)
Space and water heating			237.3600	(265)
Pumps, fans and electric keep-hot	610.0227	0.1387	84.6177	(267)
Energy for lighting	296.2206	0.1443	42.7538	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-863.7662	0.1337	-115.4727	

PV Unit electricity exported	-741.4183	0.1234	-91.5250	
Total			-206.9977	(269)
Total CO2, kg/year			157.7337	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	842.1372	1.5734	1325.0272	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	734.2371	1.5387	1129.7614	(278)
Space and water heating			2454.7886	(279)
Pumps, fans and electric keep-hot	610.0227	1.5128	922.8423	(281)
Energy for lighting	296.2206	1.5338	454.3530	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-863.7662	1.4940	-1290.5042	
PV Unit electricity exported	-741.4183	0.4530	-335.8983	
Total			-1626.4025	(283)
Total Primary energy kWh/year			2205.5814	(286)

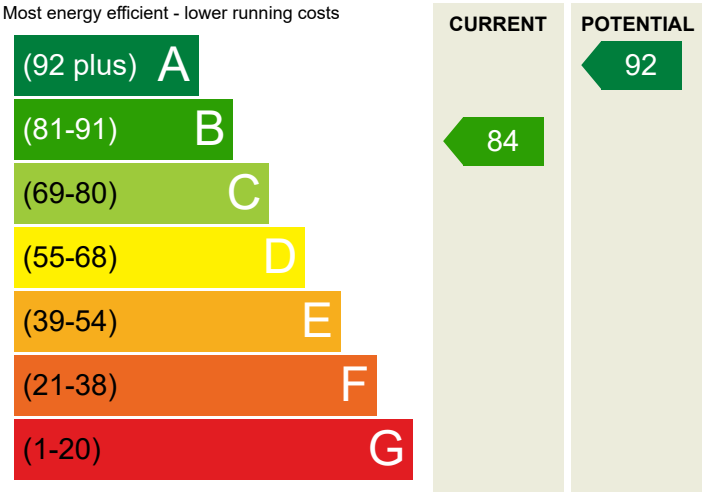
Energy Report

Dwelling Address	828 Rochdale Road, MANCHESTER, M9 8FA
Reference	78449-14-001
Assessment Date	02/07/2025
Submission Date	
Property Type	House, End-Terrace
Total Floor Area	120

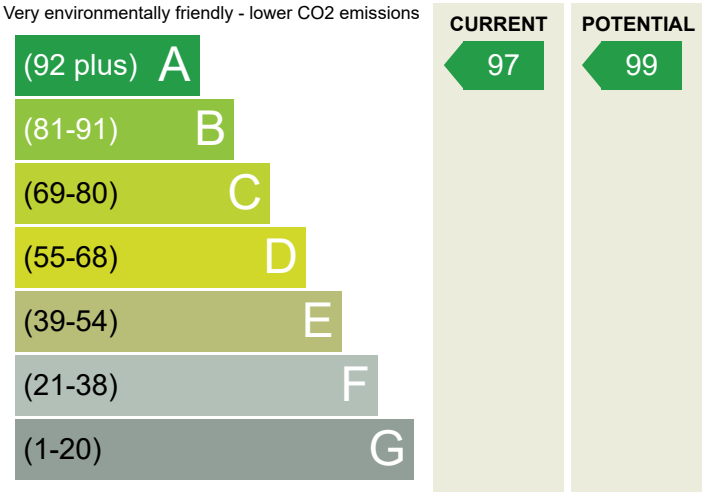
This Energy Report has been generated using the UK's National Calculation Methodology for dwellings, Standard Assessment Procedure (SAP). This methodology is used to assess the energy efficiency of dwellings which is calculated based on a dwelling's heating, hot water, ventilation and lighting usage.

This document is not an Energy Performance Certificate (EPC) as required by the Energy Performance of Buildings Regulations

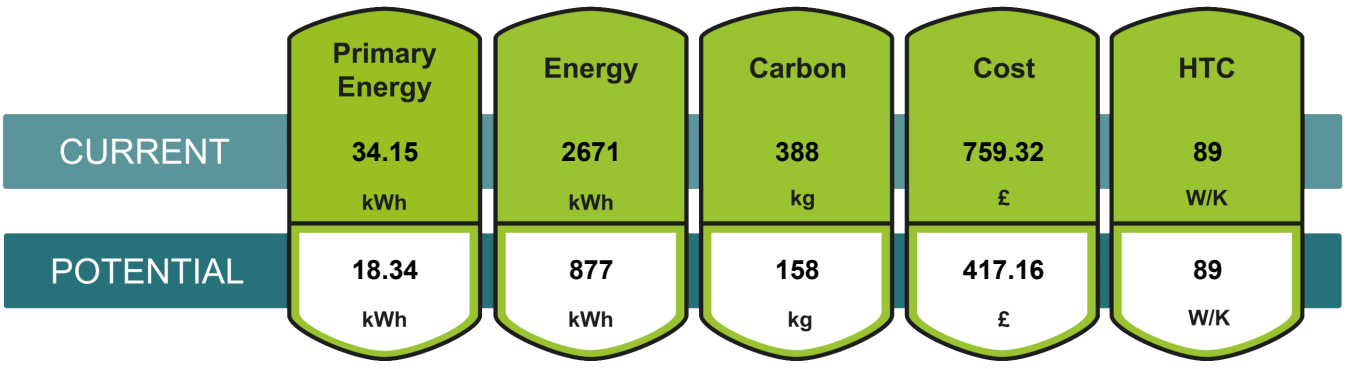
Energy Efficiency Rating



Carbon Dioxide (CO2) Emissions Rating



Additional ratings for your home



Energy Report

Breakdown of property's energy performance

Each feature is assessed as one of the following:

Very Poor | Poor | Average | Good | Very Good

Feature	Description	Energy Performance
Walls	Average thermal transmittance 0.12 W/m²K	Very Good
Roof	Average thermal transmittance 0.11 W/m²K	Very Good
Floor	Average thermal transmittance 0.09 W/m²K	Very Good
Windows	High performance glazing	Very Good
Main heating	Air source heat pump, radiators, electric	Good
Main heating controls	Programmer, room thermostat and TRVs	Good
Secondary heating	None	
Hot water	From main system	Good
Lighting	Good lighting efficiency	Good
Air tightness	Air permeability [AP50] = 5.0 m³/h.m² (as tested)	Good

Recommendations

The recommended measures provided below will help to improve the energy efficiency of the dwelling.
To reach the dwelling's potential energy rating all of the recommended measures shown below would need to be installed.
Having these measures installed individually or in any other order may give a different result when compared with the cumulative potential rating.

Recommended measures	Cumulative savings (per year)	Cumulative rating	Typical costs	Incremental savings (per year)	Cumulative CO2 rating
Solar water heating	£54	B 85	£4,000 - £7,000	£54	A 97
Photovoltaic	£342	A 92	£8,000 - £10,000	£289	A 99

Energy Report

The typical cost is based on average installation prices across the country so may not be representative of the actual costs in your area.

Estimated energy costs of the dwelling

The table below shows the estimated running costs of the space and water heating and lighting within the dwelling. It does not include the energy used from household appliances. The estimated annual costs after potential improvements indicates the total energy cost if all recommended measures named above were installed.

	Estimated annual costs	Estimated annual costs after potential improvements	Potential future savings
Lighting	£84	£84	
Heating	£387	£413	
Hot Water	£288	£209	
New Technologies e.g. Impact of PV	£0	-(£289)	
TOTAL	£759	£417	

Estimated energy use and potential savings

Space Heating
831
kWh per year

Water Heating
1014
kWh per year

Energy Report

About this document

Created by:	
Company/Trading name:	
Phone number:	
Email address:	

Disclaimer

This Energy Report should not under any circumstances be treated as a Condition Survey and cannot be used to indicate that any element of the dwelling (e.g.heating system) is working correctly.
This Energy Report must not be used in situations where an Energy Performance Certificate (EPC) is required.
This Energy Report is generated from a set of data inputs which may not reflect the actual dimensions, services or construction of the dwelling.
The calculation used to generate this report reflects the SAP Methodology current at the time of report generation.

Glossary terms for additional metrics

Primary Energy	The measure of the energy required for lighting, heating and hot water in a property. This includes the efficiency of the property's heating system, power station efficiency for electricity and the energy used to produce the fuel and deliver it to the property.
Energy Used	The estimated amount of fuel energy for lighting, heating and hot water for the property. The estimate is based on typical usage which is likely to be different to actual consumption.
Carbon (CO2)	The current emissions based on the energy estimates.
Cost	The estimated cost of energy. The cost of each unit of fuel is based on an industry standard which is likely to be different to those the occupier actually pays.
Heat Transfer Coefficient	Heat flow through the property envelope where internal and external temperatures are different.

Building Regulations England Part L (BREL) Compliance Report

Approved Document L1 2021 Edition, England assessed by Array SAP 10 program, Array

Date: Fri 03 Oct 2025 15:03:28

Project Information			
Assessed By	Paul Goddard	Building Type	House, Mid-terrace
OCDEA Registration	EES/005113	Assessment Date	2025-10-03

Dwelling Details			
Assessment Type	As built	Total Floor Area	91 m^2
Site Reference	78449-15	Plot Reference	001
Address	826 Rochdale Road, MANCHESTER, M9 8FA		

Client Details	
Name	-
Company	John Southworth
Address	Unit 10, Charles Street, DUKINFIELD, SK16 4SD

This report covers items included within the SAP calculations. It is not a complete report of regulations compliance.

1a Target emission rate and dwelling emission rate		
Fuel for main heating system	Electricity	
Target carbon dioxide emission rate	*11.44 $kgCO_2/m^2$*	
Dwelling carbon dioxide emission rate	3.62 $kgCO_2/m^2$	**OK**
1b Target primary energy rate and dwelling primary energy		
Target primary energy	*59.93 kWh_{PE}/m^2*	
Dwelling primary energy	38.33 kWh_{PE}/m^2	**OK**
1c Target fabric energy efficiency and dwelling fabric energy efficiency		
Target fabric energy efficiency	*36.9 kWh/m^2*	
Dwelling fabric energy efficiency	34.1 kWh/m^2	**OK**

2a Fabric U-values				
Element	***Maximum permitted average U-Value [W/m^2K]***	**Dwelling average U-Value [W/m^2K]**	**Element with highest individual U-Value**	
External walls	*0.26*	0.13	Walls (1) (0.13)	**OK**
Party walls	*0.2*	0	Party Wall (1) (0)	**N/A**
Curtain walls	*1.6*	0	N/A	**N/A**
Floors	*0.18*	0.09	Exposed Floor (0.14)	**OK**
Roofs	*0.16*	0.13	Roof (1) (0.13)	**OK**
Windows, doors, and roof windows	*1.6*	0.87	Front (1)	**OK**
Rooflights	*2.2*	N/A	N/A	**N/A**

2b Envelope elements (better than typically expected values are flagged with a subsequent (!))		
Name	**Net area [m^2]**	**U-Value [W/m^2K]**
Exposed wall: Walls (1)	52.2	0.13 **(!)**
Party wall: Party Wall (1)	88.21	0 **(!)**
Ground floor: GF, GF	41.18	0.08 **(!)**
Upper floor: Exposed Floor, Exposed Floor	8.6	0.14
Exposed roof: Roof (1)	49.779998779296875	0.13

2c Openings (better than typically expected values are flagged with a subsequent (!))				
Name	**Area [m^2]**	**Orientation**	**Frame factor**	**U-Value [W/m^2K]**
Front, Door	1.99	East	N/A	1 **(!)**
Front, Window	4.98	East	1.0	0.8 **(!)**
Rear, Window	3.53	West	1.0	0.8 **(!)**
Rear, Door	2.15	West	N/A	1 **(!)**

2d Thermal bridging (better than typically expected values are flagged with a subsequent (!))				
Building part **1**: Thermal bridging calculated from linear thermal transmittances for each junction				
Main element	**Junction detail**	**Source**	**Psi value [W/mK]**	**Drawing / reference**
External wall	E2: Other lintels (including other steel lintels)	Calculated by person with suitable expertise	0.115	Thermal Bridge Report

Main element	Junction detail	Source	Psi value [W/mK]	Drawing / reference
External wall	E3: Sill	Calculated by person with suitable expertise	0.017 **(!)**	Thermal Bridge Report
External wall	E4: Jamb	Calculated by person with suitable expertise	0.094	Thermal Bridge Report
External wall	E5: Ground floor (normal)	Calculated by person with suitable expertise	0.067	Thermal Bridge Report
External wall	E16: Corner (normal)	Calculated by person with suitable expertise	0.068	Thermal Bridge Report
External wall	E12: Gable (insulation at ceiling level)	Calculated by person with suitable expertise	0.077	Thermal Bridge Report
External wall	E6: Intermediate floor within a dwelling	Calculated by person with suitable expertise	0.032 **(!)**	Thermal Bridge Report
External wall	E17: Corner (inverted - internal area greater than external area)	Calculated by person with suitable expertise	-0.029 **(!)**	Thermal Bridge Report
Party wall	P1: Ground floor	SAP table default	0.32	K1
External wall	E20: Exposed floor (normal)	Calculated by person with suitable expertise	0.079	Thermal Bridge Report
External wall	E21: Exposed floor (inverted)	Calculated by person with suitable expertise	0.063	Thermal Bridge Report
External wall	E18: Party wall between dwellings	Calculated by person with suitable expertise	0.092	Thermal Bridge Report
Party wall	P4: Roof (insulation at ceiling level)	Calculated by person with suitable expertise	0.102	Thermal Bridge Report

3 Air permeability (better than typically expected values are flagged with a subsequent (!))		
Maximum permitted air permeability at 50Pa	*8 m^3/hm^2*	
Dwelling air permeability at 50Pa	5 m^3/hm^2, Measured value	OK
Air permeability test certificate reference		

4 Space heating	
Main heating system 1: Heat pump with radiators or underfloor heating - Electricity	
Efficiency	270.7%
Emitter type	Radiators
Flow temperature	45°C
System type	
Manufacturer	Daikin Europe NV
Model	EDLA09DA3V3
Commissioning	
Secondary heating system: N/A	
Fuel	N/A
Efficiency	N/A
Commissioning	

5 Hot water	
Cylinder/store - type: Cylinder	
Capacity	210 litres
Declared heat loss	1.58 kWh/day
Primary pipework insulated	Yes
Manufacturer	
Model	
Commissioning	
Waste water heat recovery system 1 - type: N/A	
Efficiency	
Manufacturer	
Model	

6 Controls	
Main heating 1 - type: Programmer, room thermostat and TRVs	
Function	
Ecodesign class	
Manufacturer	
Model	

Water heating - type: Cylinder thermostat and HW separately timed	
Manufacturer	
Model	

7 Lighting		
Minimum permitted light source efficacy	*75 lm/W*	
Lowest light source efficacy	80 lm/W	OK
External lights control	N/A	

8 Mechanical ventilation		
System type: Balanced whole-house mechanical ventilation with heat recovery		
Maximum permitted specific fan power	*1.5 W/(l/s)*	
Specific fan power	0.85 W/(l/s)	OK
Minimum permitted heat recovery efficiency	*73%*	
Heat recovery efficiency	90%	OK
Manufacturer/Model	DV110 Adroit	
Commissioning		

9 Local generation
N/A

10 Heat networks
N/A

11 Supporting documentary evidence	
Documentary evidence identified in 11.1 and 11.2 is needed to confirm the data values used for any calculations undertaken, manufacturer declarations made, and tests performed as reflected in this "As built" BREL Compliance Report are correct. 11.1 SAP Conventions, Appendix 1 (documentary evidence) schedules the minimum documentary evidence required. 11.2 Indicative photographic evidence of key stages during construction (guidance within Approved Document L, Volume 1 – Appendix B) that confirms the products identified in this BREL Compliance Report are used in this dwelling, and workmanship is of sufficient quality to support the calculated values claimed in 2a to 2d.	

12 Declarations	
a. Assessor Declaration	
This declaration by the assessor is confirmation that the contents of this BREL Compliance Report are a true and accurate reflection based upon the design and construction information submitted for this dwelling for the purpose of carrying out the assessment, and that the supporting documentary evidence (identified in 11.1 and 11.2) pursuant to Part L of the Building Regulations 2010 (as amended) has been reviewed in the course of preparing this BREL Compliance Report.	
Signed: Name:	Assessor ID: Date:
b. Client Declaration	
This declaration by the client is confirmation that the dwelling has been constructed and completed according to the specifications set out in this BREL Compliance Report, and that photographic evidence of key stages, as described in 11.2, has been provided to the Assessor for this dwelling.	
Signed: Name:	Organisation: Date:

Full SAP Calculation Printout

Property Reference	78449-15	**Issued on Date**	03/10/2025
Assessment Reference	001	**Prop Type Ref**	Mid
Property	826 Rochdale Road, MANCHESTER, M9 8FA		

SAP Rating	84 B	**DER**	3.62	**TER**	11.44
Environmental	97 A	**% DER < TER**			68.36
CO_2 Emissions (t/year)	0.32	**DFEE**	34.10	**TFEE**	36.90
Compliance Check	See BREL	**% DFEE < TFEE**			7.58
% DPER < TPER	36.04	**DPER**	38.33	**TPER**	59.93

Assessor Details	Mr. Daniel Goddard	**Assessor ID**	CP52-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	41.1800 (1b)	x	2.4800 (2b)	=	102.1264	(1b) - (3b)
First floor	49.7800 (1c)	x	2.7800 (2c)	=	138.3884	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	90.9600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	240.5148	(5)

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2. Ventilation rate

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			m3 per hour	
Number of open chimneys		0 * 80 =	0.0000	(6a)
Number of open flues		0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000	(6d)
Number of flues attached to other heater		0 * 35 =	0.0000	(6e)
Number of blocked chimneys		0 * 20 =	0.0000	(6f)
Number of intermittent extract fans		0 * 10 =	0.0000	(7a)
Number of passive vents		0 * 10 =	0.0000	(7b)
Number of flueless gas fires		0 * 40 =	0.0000	(7c)
		Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		0.0000 / (5) =	0.0000	(8)
Pressure test			Yes	
Pressure Test Method			Blower Door	
Measured/design AP50			5.0000	(17)
Infiltration rate			0.2500	(18)
Number of sides sheltered			2	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.2125	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2709	0.2656	0.2603	0.2338	0.2284	0.2019	0.2019	0.1966	0.2125	0.2284	0.2391	0.2497	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	81.0000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.3659	0.3606	0.3553	0.3287	0.3234	0.2969	0.2969	0.2916	0.3075	0.3234	0.3341	0.3447	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door			4.1400	1.0000	4.1400			(26)
Window			8.5100	0.7752	6.5969			(27)
GF			41.1800	0.0800	3.2944	75.0000	3088.5000	(28a)
Exposed Floor			8.6000	0.1400	1.2040	20.0000	172.0000	(28b)
Main	64.8536	12.6500	52.2036	0.1300	6.7865	9.0000	469.8324	(29a)
PIJ	49.7800		49.7800	0.1300	6.4714	9.0000	448.0200	(30)
Total net area of external elements Aum(A, m2)			164.4136					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		28.4932			(33)
Main dwelling								
Party Wall 1			88.2100	0.0000	0.0000	20.0000	1764.2000	(32)
Timber			96.4800			9.0000	868.3200	(32c)
FF			41.1800			18.0000	741.2400	(32d)
GF			41.1800			9.0000	370.6200	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 7922.7324 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 87.1013 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	8.6300	0.1150	0.9925
E3 Sill	8.6300	0.0170	0.1467
E4 Jamb	28.2000	0.0940	2.6508
E5 Ground floor (normal)	13.8200	0.0670	0.9259
E16 Corner (normal)	4.9600	0.0680	0.3373
E12 Gable (insulation at ceiling level)	11.0000	0.0770	0.8470
E6 Intermediate floor within a dwelling	11.0000	0.0320	0.3520
E17 Corner (inverted - internal area greater than external area)	4.9600	-0.0290	-0.1438
P1 Party wall - Ground floor	15.2800	0.3200	4.8896
E20 Exposed floor (normal)	6.4400	0.0790	0.5088
E21 Exposed floor (inverted)	12.0800	0.0630	0.7610
E18 Party wall between dwellings	21.0400	0.0920	1.9357
P4 Party wall - Roof (insulation at ceiling level)	18.1000	0.1020	1.8462

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 16.0496 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 44.5428 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	29.0444	28.6228	28.2011	26.0928	25.6712	23.5629	23.5629	23.1413	24.4062	25.6712	26.5145	27.3578	(38)
Heat transfer coeff	73.5872	73.1656	72.7439	70.6356	70.2140	68.1057	68.1057	67.6841	68.9490	70.2140	71.0573	71.9006	(39)
Average = Sum(39)m / 12 =												70.5302	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8090	0.8044	0.7997	0.7766	0.7719	0.7487	0.7487	0.7441	0.7580	0.7719	0.7812	0.7905	(40)
HLP (average)												0.7754	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6386 (42)
Hot water usage for mixer showers

68.4610	67.4321	65.9329	63.0644	60.9476	58.5869	57.2450	58.7329	60.3639	62.8986	65.8287	68.1987	(42a)

Hot water usage for baths

29.5637	29.1246	28.5063	27.3663	26.5127	25.5661	25.0549	25.6688	26.3373	27.3502	28.5137	29.4637	(42b)

Hot water usage for other uses

41.6522	40.1376	38.6230	37.1084	35.5937	34.0791	34.0791	35.5937	37.1084	38.6230	40.1376	41.6522	(42c)

Average daily hot water use (litres/day) 128.3946 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	139.6769	136.6944	133.0622	127.5391	123.0540	118.2321	116.3790	119.9955	123.8096	128.8717	134.4799	139.3147	(44)
Energy conte	221.2141	194.6510	204.5117	174.5947	165.6543	145.3802	140.7503	148.5795	152.6696	174.8777	191.5913	218.1331	(45)
Energy content (annual)										Total = Sum(45)m =		2132.6075	

Distribution loss (46)m = 0.15 x (45)m

33.1821	29.1976	30.6768	26.1892	24.8482	21.8070	21.1126	22.2869	22.9004	26.2317	28.7387	32.7200	(46)

Water storage loss:
Store volume 210.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.5800 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.8532 (55)
Total storage loss

26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(56)

If cylinder contains dedicated solar storage

26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(57)
23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Primary loss
Combi loss
Total heat required for water heating calculated for each month

270.9257	239.5518	254.2233	222.7027	215.3659	193.4882	190.4619	198.2911	200.7776	224.5893	239.6993	267.8447	(62)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

WWHRS
PV diverter
Solar input
FGHRS
Output from w/h

270.9257	239.5518	254.2233	222.7027	215.3659	193.4882	190.4619	198.2911	200.7776	224.5893	239.6993	267.8447	(64)

Total per year (kWh/year) = Sum(64)m = 2717.9215 (64)
12Total per year (kWh/year) 2718 (64)
Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)
Heat gains from water heating, kWh/month

113.3230	100.6421	107.7694	96.5391	94.8493	86.8253	86.5688	89.1720	89.2490	97.9161	102.1905	112.2985	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	145.9975	161.6401	145.9975	150.8641	145.9975	150.8641	145.9975	145.9975	150.8641	145.9975	150.8641	145.9975	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	240.8328	243.3319	237.0343	223.6274	206.7036	190.7976	180.1714	177.6723	183.9699	197.3768	214.3007	230.2066	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	(71)
Water heating gains (Table 5)	152.3158	149.7650	144.8514	134.0821	127.4857	120.5907	116.3559	119.8548	123.9570	131.6077	141.9313	150.9389	(72)
Total internal gains	601.7256	617.3165	590.4626	571.1531	542.7662	524.8319	505.1042	506.1041	521.3705	537.5615	569.6755	589.7225	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a	g Specific data	FF Specific data	Access factor	Gains W

					W/m2	or Table 6b		or Table 6c		Table 6d			
East					4.9800	19.6403		0.3000	0.0000	0.7700		22.5938	(76)
West					3.5300	19.6403		0.3000	0.0000	0.7700		16.0153	(80)
Solar gains	38.6090	75.5274	124.3829	181.4051	222.3188	227.5828	216.6681	186.1147	144.6625	89.6197	48.1409	31.7502	(83)
Total gains	640.3346	692.8439	714.8456	752.5582	765.0850	752.4147	721.7724	692.2188	666.0330	627.1812	617.8164	621.4727	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	29.9068	30.0792	30.2535	31.1565	31.3436	32.3139	32.3139	32.5152	31.9186	31.3436	30.9716	30.6084	
alpha	2.9938	3.0053	3.0169	3.0771	3.0896	3.1543	3.1543	3.1677	3.1279	3.0896	3.0648	3.0406	
util living area	0.9265	0.9051	0.8739	0.8005	0.6927	0.5307	0.3996	0.4294	0.6194	0.8096	0.8956	0.9309	(86)
Living	19.2282	19.4614	19.7964	20.2867	20.6516	20.8954	20.9678	20.9595	20.8198	20.3698	19.7744	19.2315	
Non living	18.6144	18.8450	19.1745	19.6594	20.0000	20.2268	20.2808	20.2795	20.1607	19.7473	19.1690	18.6294	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.0936	19.4614	19.7964	20.2867	20.6516	20.8954	20.9678	20.9595	20.8198	20.3698	19.7744	19.4788	(87)
Th 2	20.2455	20.2495	20.2536	20.2737	20.2777	20.2980	20.2980	20.3020	20.2899	20.2777	20.2697	20.2616	(88)
util rest of house	0.9187	0.8951	0.8602	0.7788	0.6590	0.4827	0.3406	0.3702	0.5727	0.7849	0.8832	0.9236	(89)
MIT 2	19.4111	18.8450	19.1745	19.6594	20.0000	20.2268	20.2808	20.2795	20.1607	19.7473	19.1690	18.8577	(90)
Living area fraction										fLA = Living area / (4) =		0.3196	(91)
MIT	19.6292	19.0420	19.3732	19.8599	20.2082	20.4405	20.5004	20.4968	20.3713	19.9462	19.3625	19.0562	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6292	19.0420	19.3732	19.8599	20.2082	20.4405	20.5004	20.4968	20.3713	19.9462	19.3625	19.0562	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9114	0.8762	0.8417	0.7653	0.6556	0.4927	0.3579	0.3870	0.5783	0.7723	0.8653	0.9093	(94)
Useful gains	583.6055	607.0518	601.6955	575.9327	501.6028	370.7506	258.3504	267.9168	385.1931	484.3734	534.5741	565.0785	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1128.0364	1034.7055	936.4503	774.1591	597.3978	397.7702	265.6377	277.2882	432.4032	656.2346	871.3380	1068.1696	(97)
Space heating kWh	405.0565	287.3833	249.0575	142.7230	71.2714	0.0000	0.0000	0.0000	0.0000	127.8647	242.4700	374.2997	(98a)
Space heating requirement - total per year (kWh/year)												1900.1263	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	405.0565	287.3833	249.0575	142.7230	71.2714	0.0000	0.0000	0.0000	0.0000	127.8647	242.4700	374.2997	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1900.1263	
Space heating per m2											(98c) / (4) =	20.8897	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												270.7081	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	405.0565	287.3833	249.0575	142.7230	71.2714	0.0000	0.0000	0.0000	0.0000	127.8647	242.4700	374.2997	(98)
Space heating efficiency (main heating system 1)	270.7081	270.7081	270.7081	270.7081	270.7081	0.0000	0.0000	0.0000	0.0000	270.7081	270.7081	270.7081	(210)
Space heating fuel (main heating system)	149.6285	106.1598	92.0022	52.7221	26.3278	0.0000	0.0000	0.0000	0.0000	47.2334	89.5688	138.2669	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	270.9257	239.5518	254.2233	222.7027	215.3659	193.4882	190.4619	198.2911	200.7776	224.5893	239.6993	267.8447	(64)
Efficiency of water heater												281.1060	(216)
(217)m	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	(217)
Fuel for water heating, kWh/month	96.3785	85.2176	90.4368	79.2237	76.6138	68.8310	67.7545	70.5396	71.4242	79.8949	85.2701	95.2824	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	29.6563	26.7864	29.6563	28.6997	29.6563	28.6997	29.6563	29.6563	28.6997	29.6563	28.6997	29.6563	(231)
Lighting	30.8703	24.7653	22.2984	16.3368	12.6190	10.3098	11.5115	14.9631	19.4355	25.5005	28.8027	31.7283	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	701.9096	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	281.1060	
Water heating fuel used	966.8671	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.1900)		
mechanical ventilation fans (SFP = 1.1900)	349.1794	(230a)
Total electricity for the above, kWh/year	349.1794	(231)
Electricity for lighting (calculated in Appendix L)	249.1413	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2267.0974	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	701.9096	0.1552	108.9520	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	966.8671	0.1410	136.2905	(264)
Space and water heating			245.2426	(265)
Pumps, fans and electric keep-hot	349.1794	0.1387	48.4355	(267)
Energy for lighting	249.1413	0.1443	35.9588	(268)
Total CO2, kg/year			329.6368	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.6200	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	701.9096	1.5746	1105.2587	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	966.8671	1.5212	1470.8230	(278)
Space and water heating			2576.0817	(279)
Pumps, fans and electric keep-hot	349.1794	1.5128	528.2386	(281)
Energy for lighting	249.1413	1.5338	382.1413	(282)
Total Primary energy kWh/year			3486.4616	(286)
Dwelling Primary energy Rate (DPER)			38.3300	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	41.1800	(1b)	x 2.4800	(2b) =	102.1264	(1b) - (3b)
First floor	49.7800	(1c)	x 2.7800	(2c) =	138.3884	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	90.9600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		240.5148	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1247	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3747	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3185	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)

Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4061	0.3982	0.3902	0.3504	0.3424	0.3026	0.3026	0.2946	0.3185	0.3424	0.3583	0.3743 (22b)
Effective ac	0.5825	0.5793	0.5761	0.5614	0.5586	0.5458	0.5458	0.5434	0.5507	0.5586	0.5642	0.5700 (25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			4.1400	1.0000	4.1400			(26)
TER Opening Type			8.5100	1.1450	9.7443			(27)
GF			41.1800	0.1300	5.3534			(28a)
Exposed Floor			8.6000	0.1300	1.1180			(28b)
Main	64.8536	12.6500	52.2036	0.1800	9.3966			(29a)
PIJ	49.7800		49.7800	0.1100	5.4758			(30)
Total net area of external elements Aum(A, m2)			164.4136					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	35.2281			(33)
Main dwelling								
Party Wall 1			88.2100	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	87.1013	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	8.6300	0.0500	0.4315
E3 Sill	8.6300	0.0500	0.4315
E4 Jamb	28.2000	0.0500	1.4100
E5 Ground floor (normal)	13.8200	0.1600	2.2112
E16 Corner (normal)	4.9600	0.0900	0.4464
E12 Gable (insulation at ceiling level)	11.0000	0.0600	0.6600
E6 Intermediate floor within a dwelling	11.0000	0.0000	0.0000
E17 Corner (inverted - internal area greater than external area)	4.9600	-0.0900	-0.4464
P1 Party wall - Ground floor	15.2800	0.0800	1.2224
E20 Exposed floor (normal)	6.4400	0.3200	2.0608
E21 Exposed floor (inverted)	12.0800	0.3200	3.8656
E18 Party wall between dwellings	21.0400	0.0600	1.2624
P4 Party wall - Roof (insulation at ceiling level)	18.1000	0.1200	2.1720

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		15.7274	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	50.9555	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	46.2302	45.9760	45.7269	44.5568	44.3378	43.3187	43.3187	43.1299	43.7112	44.3378	44.7807	45.2438	(38)
Heat transfer coeff	97.1857	96.9316	96.6824	95.5123	95.2934	94.2742	94.2742	94.0855	94.6668	95.2934	95.7363	96.1993	(39)
Average = Sum(39)m / 12 =												95.5112	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0684	1.0657	1.0629	1.0500	1.0476	1.0364	1.0364	1.0344	1.0408	1.0476	1.0525	1.0576	(40)
HLP (average)												1.0500	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy											2.6386	(42)
Hot water usage for mixer showers	68.4610	67.4321	65.9329	63.0644	60.9476	58.5869	57.2450	58.7329	60.3639	62.8986	65.8287	68.1987 (42a)
Hot water usage for baths	29.5637	29.1246	28.5063	27.3663	26.5127	25.5661	25.0549	25.6688	26.3373	27.3502	28.5137	29.4637 (42b)
Hot water usage for other uses	41.6522	40.1376	38.6230	37.1084	35.5937	34.0791	34.0791	35.5937	37.1084	38.6230	40.1376	41.6522 (42c)
Average daily hot water use (litres/day)												128.3946 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	139.6769	136.6944	133.0622	127.5391	123.0540	118.2321	116.3790	119.9955	123.8096	128.8717	134.4799	139.3147	(44)
Energy conte	221.2141	194.6510	204.5117	174.5947	165.6543	145.3802	140.7503	148.5795	152.6696	174.8777	191.5913	218.1331	(45)
Energy content (annual)										Total = Sum(45)m =		2132.6075	
Distribution loss (46)m = 0.15 x (45)m	33.1821	29.1976	30.6768	26.1892	24.8482	21.8070	21.1126	22.2869	22.9004	26.2317	28.7387	32.7200	(46)
Water storage loss:													
Store volume												210.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7016	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.9188	(55)
Total storage loss	28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842	(56)
If cylinder contains dedicated solar storage	28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	272.9607	241.3898	256.2583	224.6720	217.4009	195.4575	192.4969	200.3261	202.7469	226.6243	241.6687	269.8797	(62)
WWHRS	-31.2975	-27.6798	-28.9847	-24.0004	-22.3675	-19.1401	-17.9408	-19.0782	-19.8031	-23.3456	-26.4477	-30.7179	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	241.6632	213.7101	227.2737	200.6716	195.0334	176.3175	174.5562	181.2479	182.9439	203.2787	215.2209	239.1618	(64)
										Total per year (kWh/year) = Sum(64)m =		2451.0786	(64)
12Total per year (kWh/year)												2451	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	114.9510	102.1125	109.3974	98.1146	96.4773	88.4008	88.1968	90.7999	90.8245	99.5441	103.7660	113.9265	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

(66)m	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	142.2156	157.4530	142.2156	146.9561	142.2156	146.9561	142.2156	142.2156	146.9561	142.2156	146.9561	142.2156	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	240.8328	243.3319	237.0343	223.6274	206.7036	190.7976	180.1714	177.6723	183.9699	197.3768	214.3007	230.2066	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	(71)
Water heating gains (Table 5)													
	154.5040	151.9532	147.0395	136.2703	129.6738	122.7789	118.5440	122.0429	126.1452	133.7959	144.1194	153.1270	(72)
Total internal gains													
	603.1319	618.3176	591.8689	572.4333	544.1725	523.1121	503.5105	504.5103	519.6507	538.9678	570.9557	591.1288	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	4.9800	19.6403	0.6300	0.7000	0.7700	29.8916	(76)
West	3.5300	19.6403	0.6300	0.7000	0.7700	21.1882	(80)

Solar gains	51.0797	99.9228	164.5586	239.9990	294.1277	301.0921	286.6519	246.2298	191.3885	118.5668	63.6904	42.0055	(83)
Total gains	654.2116	718.2404	756.4276	812.4323	838.3003	824.2042	790.1625	750.7401	711.0392	657.5346	634.6461	633.1343	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	22.6449	22.7043	22.7628	23.0416	23.0946	23.3442	23.3442	23.3911	23.2474	23.0946	22.9877	22.8771	
alpha	2.5097	2.5136	2.5175	2.5361	2.5396	2.5563	2.5563	2.5594	2.5498	2.5396	2.5325	2.5251	
util living area													
	0.9363	0.9179	0.8900	0.8294	0.7371	0.6002	0.4715	0.5071	0.6872	0.8450	0.9135	0.9408	(86)
MIT	18.4665	18.7376	19.1692	19.7832	20.3219	20.7241	20.8928	20.8676	20.5829	19.8994	19.1053	18.4305	(87)
Th 2	20.0267	20.0290	20.0312	20.0418	20.0438	20.0531	20.0531	20.0548	20.0495	20.0438	20.0398	20.0356	(88)
util rest of house													
	0.9284	0.9077	0.8757	0.8060	0.6983	0.5374	0.3858	0.4222	0.6306	0.8190	0.9010	0.9333	(89)
MIT 2	17.0633	17.4054	17.9489	18.7154	19.3635	19.8213	19.9856	19.9670	19.6760	18.8716	17.8806	17.0230	(90)
Living area fraction										fLA = Living area / (4) =		0.3196	(91)
MIT	17.5118	17.8312	18.3389	19.0566	19.6698	20.1098	20.2755	20.2548	19.9659	19.2001	18.2720	17.4728	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.5118	17.8312	18.3389	19.0566	19.6698	20.1098	20.2755	20.2548	19.9659	19.2001	18.2720	17.4728	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9004	0.8773	0.8442	0.7775	0.6812	0.5414	0.4069	0.4412	0.6251	0.7913	0.8712	0.9063	(94)
Useful gains	589.0216	630.1383	638.5494	631.6864	571.0784	446.2550	321.5222	331.1952	444.4610	520.3070	552.8988	573.8331	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1283.9967	1253.4418	1144.6149	970.0843	759.4665	519.4329	346.5070	362.6828	555.3014	819.5308	1069.5680	1276.8325	(97)
Space heating kWh													
	517.0614	418.8600	376.5127	243.6465	140.1607	0.0000	0.0000	0.0000	0.0000	222.6225	372.0018	523.0315	(98a)
Space heating requirement - total per year (kWh/year)												2813.8972	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	517.0614	418.8600	376.5127	243.6465	140.1607	0.0000	0.0000	0.0000	0.0000	222.6225	372.0018	523.0315	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2813.8972	
Space heating per m2											(98c) / (4) =	30.9355	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	517.0614	418.8600	376.5127	243.6465	140.1607	0.0000	0.0000	0.0000	0.0000	222.6225	372.0018	523.0315	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	560.1966	453.8028	407.9227	263.9724	151.8534	0.0000	0.0000	0.0000	0.0000	241.1945	403.0355	566.6647	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	241.6632	213.7101	227.2737	200.6716	195.0334	176.3175	174.5562	181.2479	182.9439	203.2787	215.2209	239.1618	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.7207	85.5407	85.1837	84.4960	83.3316	79.8000	79.8000	79.8000	79.8000	84.2641	85.2751	85.7649	(217)
Fuel for water heating, kWh/month													
	281.9193	249.8345	266.8041	237.4923	234.0450	220.9492	218.7421	227.1276	229.2530	241.2400	252.3842	278.8574	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)

Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	29.5496	23.7058	21.3444	15.6378	12.0791	9.8687	11.0190	14.3229	18.6040	24.4095	27.5704	30.3709	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-38.9812	-55.1702	-79.5760	-89.7571	-96.9883	-90.5718	-89.4598	-84.3870	-75.4216	-63.2498	-42.9366	-33.6769	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-21.3144	-44.9402	-89.5251	-134.7575	-178.4789	-179.4591	-177.3409	-150.0006	-109.7478	-64.3537	-28.4842	-16.8460	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	3048.6426	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2938.6486	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	238.4821	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-2035.4247	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	4276.3487	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3048.6426	0.2100	640.2150	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2938.6486	0.2100	617.1162	(264)
Space and water heating			1257.3312	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	238.4821	0.1443	34.4203	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-840.1762	0.1345	-113.0202	
PV Unit electricity exported	-1195.2485	0.1258	-150.3985	
Total			-263.4187	(269)
Total CO2, kg/year			1040.2621	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.4400	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	3048.6426	1.1300	3444.9662	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2938.6486	1.1300	3320.6730	(278)
Space and water heating			6765.6391	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	238.4821	1.5338	365.7919	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-840.1762	1.4972	-1257.8767	
PV Unit electricity exported	-1195.2485	0.4619	-552.0620	
Total			-1809.9387	(283)
Total Primary energy kWh/year			5451.5931	(286)
Target Primary Energy Rate (TPER)			59.9300	(287)

Full SAP Calculation Printout

Property Reference	78449-15	**Issued on Date**	03/10/2025
Assessment Reference	001	**Prop Type Ref**	Mid
Property	826 Rochdale Road, MANCHESTER, M9 8FA		

SAP Rating	84 B	**DER**	3.62	**TER**	11.44
Environmental	97 A	**% DER < TER**			68.36
CO_2 Emissions (t/year)	0.32	**DFEE**	34.10	**TFEE**	36.90
Compliance Check	See BREL	**% DFEE < TFEE**			7.58
% DPER < TPER	36.04	**DPER**	38.33	**TPER**	59.93

Assessor Details	Mr. Daniel Goddard	**Assessor ID**	CP52-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	41.1800	(1b)	x 2.4800	(2b) =	102.1264	(1b) - (3b)
First floor	49.7800	(1c)	x 2.7800	(2c) =	138.3884	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	90.9600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		240.5148	(5)

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2. Ventilation rate

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			m3 per hour	
Number of open chimneys		0 * 80 =	0.0000	(6a)
Number of open flues		0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000	(6d)
Number of flues attached to other heater		0 * 35 =	0.0000	(6e)
Number of blocked chimneys		0 * 20 =	0.0000	(6f)
Number of intermittent extract fans		3 * 10 =	30.0000	(7a)
Number of passive vents		0 * 10 =	0.0000	(7b)
Number of flueless gas fires		0 * 40 =	0.0000	(7c)
			Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		30.0000 / (5) =	0.1247	(8)
Pressure test			Yes	
Pressure Test Method			Blower Door	
Measured/design AP50			5.0000	(17)
Infiltration rate			0.3747	(18)
Number of sides sheltered			2	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.3185	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4061	0.3982	0.3902	0.3504	0.3424	0.3026	0.3026	0.2946	0.3185	0.3424	0.3583	0.3743	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0.0000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5825	0.5793	0.5761	0.5614	0.5586	0.5458	0.5458	0.5434	0.5507	0.5586	0.5642	0.5700	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door			4.1400	1.0000	4.1400			(26)
Window			8.5100	0.7752	6.5969			(27)
GF			41.1800	0.0800	3.2944	75.0000	3088.5000	(28a)
Exposed Floor			8.6000	0.1400	1.2040	20.0000	172.0000	(28b)
Main	64.8536	12.6500	52.2036	0.1300	6.7865	9.0000	469.8324	(29a)
PIJ	49.7800		49.7800	0.1300	6.4714	9.0000	448.0200	(30)
Total net area of external elements Aum(A, m2)			164.4136					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	28.4932			(33)
Main dwelling								
Party Wall 1			88.2100	0.0000	0.0000	20.0000	1764.2000	(32)
Timber			96.4800			9.0000	868.3200	(32c)
FF			41.1800			18.0000	741.2400	(32d)
GF			41.1800			9.0000	370.6200	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	7922.7324 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		87.1013 (35)
List of Thermal Bridges		

	Length	Psi-value	Total	
K1 Element				
E2 Other lintels (including other steel lintels)	8.6300	0.1150	0.9925	
E3 Sill	8.6300	0.0170	0.1467	
E4 Jamb	28.2000	0.0940	2.6508	
E5 Ground floor (normal)	13.8200	0.0670	0.9259	
E16 Corner (normal)	4.9600	0.0680	0.3373	
E12 Gable (insulation at ceiling level)	11.0000	0.0770	0.8470	
E6 Intermediate floor within a dwelling	11.0000	0.0320	0.3520	
E17 Corner (inverted - internal area greater than external area)	4.9600	-0.0290	-0.1438	
P1 Party wall - Ground floor	15.2800	0.3200	4.8896	
E20 Exposed floor (normal)	6.4400	0.0790	0.5088	
E21 Exposed floor (inverted)	12.0800	0.0630	0.7610	
E18 Party wall between dwellings	21.0400	0.0920	1.9357	
P4 Party wall - Roof (insulation at ceiling level)	18.1000	0.1020	1.8462	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			16.0496	(36)
Point Thermal bridges		(36a) =	0.0000	
Total fabric heat loss		(33) + (36) + (36a) =	44.5428	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	46.2302	45.9760	45.7269	44.5568	44.3378	43.3187	43.3187	43.1299	43.7112	44.3378	44.7807	45.2438	(38)
Heat transfer coeff	90.7730	90.5188	90.2697	89.0996	88.8806	87.8615	87.8615	87.6727	88.2540	88.8806	89.3235	89.7865	(39)
Average = Sum(39)m / 12 =												89.0985	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9979	0.9951	0.9924	0.9795	0.9771	0.9659	0.9659	0.9639	0.9703	0.9771	0.9820	0.9871	(40)
HLP (average)												0.9795	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy											2.6386	(42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	29.5637	29.1246	28.5063	27.3663	26.5127	25.5661	25.0549	25.6688	26.3373	27.3502	28.5137	29.4637	(42b)
Hot water usage for other uses	41.6522	40.1376	38.6230	37.1084	35.5937	34.0791	34.0791	35.5937	37.1084	38.6230	40.1376	41.6522	(42c)
Average daily hot water use (litres/day)												65.2759	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	71.2159	69.2622	67.1293	64.4747	62.1064	59.6452	59.1340	61.2626	63.4457	65.9732	68.6513	71.1160	(44)
Energy conte	112.7886	98.6285	103.1753	88.2626	83.6072	73.3408	71.5174	75.8559	78.2349	89.5249	97.8063	111.3504	(45)
Energy content (annual)										Total = Sum(45)m =		1084.0928	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	95.8703	83.8342	87.6990	75.0232	71.0661	62.3397	60.7898	64.4775	66.4996	76.0962	83.1354	94.6479	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	95.8703	83.8342	87.6990	75.0232	71.0661	62.3397	60.7898	64.4775	66.4996	76.0962	83.1354	94.6479	(64)
									Total per year (kWh/year) = Sum(64)m =			921.4789	(64)
12Total per year (kWh/year)												921	(64)
Electric shower(s)	54.8258	48.8503	53.3426	50.9042	51.8594	49.4688	51.1178	51.8594	50.9042	53.3426	52.3396	54.8258	(64a)
					Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =							623.6406	(64a)
Heat gains from water heating, kWh/month	37.6740	33.1711	35.2604	31.4819	30.7314	27.9521	27.9769	29.0842	29.3510	32.3597	33.8687	37.3684	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	145.9975	161.6401	145.9975	150.8641	145.9975	150.8641	145.9975	145.9975	150.8641	145.9975	150.8641	145.9975	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	240.8328	243.3319	237.0343	223.6274	206.7036	190.7976	180.1714	177.6723	183.9699	197.3768	214.3007	230.2066	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	(71)
Water heating gains (Table 5)	50.6372	49.3618	47.3930	43.7248	41.3056	38.8224	37.6034	39.0917	40.7652	43.4942	47.0399	50.2264	(72)
Total internal gains	500.0470	516.9133	493.0043	480.7957	456.5862	443.0635	426.3517	425.3410	438.1787	449.4480	474.7841	489.0100	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	4.9800	19.6403	0.3000	0.0000	0.7700	22.5938	(76)
West	3.5300	19.6403	0.3000	0.0000	0.7700	16.0153	(80)

Solar gains	38.6090	75.5274	124.3829	181.4051	222.3188	227.5828	216.6681	186.1147	144.6625	89.6197	48.1409	31.7502	(83)

Total gains	538.6560	592.4407	617.3872	662.2009	678.9049	670.6464	643.0199	611.4557	582.8412	539.0677	522.9250	520.7602	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	24.2446	24.3127	24.3798	24.7000	24.7608	25.0481	25.0481	25.1020	24.9366	24.7608	24.6381	24.5110	
alpha	2.6163	2.6208	2.6253	2.6467	2.6507	2.6699	2.6699	2.6735	2.6624	2.6507	2.6425	2.6341	
util living area	0.9559	0.9417	0.9214	0.8722	0.7931	0.6608	0.5283	0.5653	0.7427	0.8840	0.9385	0.9594	(86)
MIT	18.4198	18.6789	19.0881	19.7002	20.2511	20.6888	20.8776	20.8494	20.5410	19.8360	19.0522	18.3883	(87)
Th 2	20.0850	20.0874	20.0897	20.1004	20.1024	20.1118	20.1118	20.1136	20.1082	20.1024	20.0984	20.0941	(88)
util rest of house	0.9503	0.9342	0.9107	0.8536	0.7597	0.6014	0.4422	0.4812	0.6918	0.8635	0.9294	0.9542	(89)
MIT 2	17.7111	17.9680	18.3730	18.9767	19.5019	19.9005	20.0485	20.0317	19.7770	19.1170	18.3471	17.6860	(90)
Living area fraction										fLA = Living area / (4) =		0.3196	(91)
MIT	17.9375	18.1952	18.6016	19.2080	19.7413	20.1525	20.3135	20.2930	20.0212	19.3468	18.5724	17.9105	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.9375	18.1952	18.6016	19.2080	19.7413	20.1525	20.3135	20.2930	20.0212	19.3468	18.5724	17.9105	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9326	0.9142	0.8887	0.8315	0.7445	0.6044	0.4629	0.4994	0.6862	0.8424	0.9094	0.9374	(94)
Useful gains	502.3694	541.5870	548.6931	550.6202	505.4243	405.3280	297.6315	305.3646	399.9404	454.1350	475.5614	488.1676	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1237.9208	1203.4648	1092.4050	918.4345	714.7182	487.8473	326.2740	341.3136	522.5687	777.4204	1024.7572	1231.0144	(97)
Space heating kWh	547.2502	444.7819	404.5217	264.8262	155.7146	0.0000	0.0000	0.0000	0.0000	240.5244	395.4210	552.6780	(98a)
Space heating requirement - total per year (kWh/year)												3005.7180	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	547.2502	444.7819	404.5217	264.8262	155.7146	0.0000	0.0000	0.0000	0.0000	240.5244	395.4210	552.6780	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3005.7180	
Space heating per m2											(98c) / (4) =	33.0444	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	825.8978	650.1748	666.3128	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.6697	0.7435	0.7164	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	553.1317	483.4155	477.3560	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	708.6181	679.8104	645.9957	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	111.9502	146.1178	125.4679	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	27.9876	36.5295	31.3670	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												95.8840	(107)
Energy for space heating												33.0444	(99)
Energy for space cooling												1.0541	(108)
Total												34.0985	(109)
Fabric Energy Efficiency (DFEE)												34.1	(109)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	41.1800	(1b) x	2.4800	(2b) =	102.1264	(1b) - (3b)
First floor	49.7800	(1c) x	2.7800	(2c) =	138.3884	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	90.9600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		240.5148	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)

Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1247 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3747 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3185 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4061	0.3982	0.3902	0.3504	0.3424	0.3026	0.3026	0.2946	0.3185	0.3424	0.3583	0.3743	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5825	0.5793	0.5761	0.5614	0.5586	0.5458	0.5458	0.5434	0.5507	0.5586	0.5642	0.5700	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			4.1400	1.0000	4.1400			(26)
TER Opening Type			8.5100	1.1450	9.7443			(27)
GF			41.1800	0.1300	5.3534			(28a)
Exposed Floor			8.6000	0.1300	1.1180			(28b)
Main	64.8536	12.6500	52.2036	0.1800	9.3966			(29a)
PIJ	49.7800		49.7800	0.1100	5.4758			(30)
Total net area of external elements Aum(A, m2)			164.4136					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		35.2281			(33)
Main dwelling								
Party Wall 1			88.2100	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	87.1013 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	8.6300	0.0500	0.4315
E3 Sill	8.6300	0.0500	0.4315
E4 Jamb	28.2000	0.0500	1.4100
E5 Ground floor (normal)	13.8200	0.1600	2.2112
E16 Corner (normal)	4.9600	0.0900	0.4464
E12 Gable (insulation at ceiling level)	11.0000	0.0600	0.6600
E6 Intermediate floor within a dwelling	11.0000	0.0000	0.0000
E17 Corner (inverted - internal area greater than external area)	4.9600	-0.0900	-0.4464
P1 Party wall - Ground floor	15.2800	0.0800	1.2224
E20 Exposed floor (normal)	6.4400	0.3200	2.0608
E21 Exposed floor (inverted)	12.0800	0.3200	3.8656
E18 Party wall between dwellings	21.0400	0.0600	1.2624
P4 Party wall - Roof (insulation at ceiling level)	18.1000	0.1200	2.1720

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		15.7274 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	50.9555 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	46.2302	45.9760	45.7269	44.5568	44.3378	43.3187	43.3187	43.1299	43.7112	44.3378	44.7807	45.2438	(38)
Heat transfer coeff	97.1857	96.9316	96.6824	95.5123	95.2934	94.2742	94.2742	94.0855	94.6668	95.2934	95.7363	96.1993	(39)
Average = Sum(39)m / 12 =												95.5112	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0684	1.0657	1.0629	1.0500	1.0476	1.0364	1.0364	1.0344	1.0408	1.0476	1.0525	1.0576	(40)
HLP (average)												1.0500	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.6386 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

29.5637	29.1246	28.5063	27.3663	26.5127	25.5661	25.0549	25.6688	26.3373	27.3502	28.5137	29.4637	(42b)

Hot water usage for other uses

41.6522	40.1376	38.6230	37.1084	35.5937	34.0791	34.0791	35.5937	37.1084	38.6230	40.1376	41.6522	(42c)

Average daily hot water use (litres/day)	65.2759 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	71.2159	69.2622	67.1293	64.4747	62.1064	59.6452	59.1340	61.2626	63.4457	65.9732	68.6513	71.1160	(44)
Energy conte	112.7886	98.6285	103.1753	88.2626	83.6072	73.3408	71.5174	75.8559	78.2349	89.5249	97.8063	111.3504	(45)
Energy content (annual)										Total = Sum(45)m =		1084.0928	
Distribution loss (46)m = 0.15 x (45)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	95.8703	83.8342	87.6990	75.0232	71.0661	62.3397	60.7898	64.4775	66.4996	76.0962	83.1354	94.6479	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													

	95.8703	83.8342	87.6990	75.0232	71.0661	62.3397	60.7898	64.4775	66.4996	76.0962	83.1354	94.6479 (64)
									Total per year (kWh/year) = Sum(64)m =			921.4789 (64)
12Total per year (kWh/year)												921 (64)
Electric shower(s)												
	54.8258	48.8503	53.3426	50.9042	51.8594	49.4688	51.1178	51.8594	50.9042	53.3426	52.3396	54.8258 (64a)
								Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =				623.6406 (64a)
Heat gains from water heating, kWh/month												
	37.6740	33.1711	35.2604	31.4819	30.7314	27.9521	27.9769	29.0842	29.3510	32.3597	33.8687	37.3684 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	142.2156	157.4530	142.2156	146.9561	142.2156	146.9561	142.2156	142.2156	146.9561	142.2156	146.9561	142.2156	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	240.8328	243.3319	237.0343	223.6274	206.7036	190.7976	180.1714	177.6723	183.9699	197.3768	214.3007	230.2066	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	(71)
Water heating gains (Table 5)													
	50.6372	49.3618	47.3930	43.7248	41.3056	38.8224	37.6034	39.0917	40.7652	43.4942	47.0399	50.2264	(72)
Total internal gains													
	496.2651	512.7262	489.2224	476.8878	452.8043	439.1556	422.5699	421.5591	434.2708	445.6662	470.8762	485.2281	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	4.9800	19.6403	0.6300	0.7000	0.7700	29.8916	(76)
West	3.5300	19.6403	0.6300	0.7000	0.7700	21.1882	(80)

Solar gains	51.0797	99.9228	164.5586	239.9990	294.1277	301.0921	286.6519	246.2298	191.3885	118.5668	63.6904	42.0055	(83)
Total gains	547.3448	612.6490	653.7810	716.8868	746.9320	740.2477	709.2218	667.7889	625.6593	564.2330	534.5666	527.2336	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	22.6449	22.7043	22.7628	23.0416	23.0946	23.3442	23.3442	23.3911	23.2474	23.0946	22.9877	22.8771	
alpha	2.5097	2.5136	2.5175	2.5361	2.5396	2.5563	2.5563	2.5594	2.5498	2.5396	2.5325	2.5251	
util living area													
	0.9557	0.9398	0.9161	0.8613	0.7758	0.6421	0.5125	0.5525	0.7336	0.8808	0.9381	0.9594	(86)
MIT	18.2422	18.5281	18.9823	19.6407	20.2246	20.6750	20.8697	20.8378	20.5077	19.7511	18.9079	18.2044	(87)
Th 2	20.0267	20.0290	20.0312	20.0418	20.0438	20.0531	20.0531	20.0548	20.0495	20.0438	20.0398	20.0356	(88)
util rest of house													
	0.9499	0.9319	0.9044	0.8408	0.7395	0.5795	0.4228	0.4645	0.6796	0.8590	0.9287	0.9540	(89)
MIT 2	17.4981	17.7812	18.2298	18.8766	19.4303	19.8370	19.9879	19.9692	19.6997	18.9942	18.1669	17.4665	(90)
Living area fraction										fLA = Living area / (4) =		0.3196	(91)
MIT	17.7359	18.0199	18.4703	19.1208	19.6841	20.1048	20.2697	20.2468	19.9579	19.2361	18.4037	17.7023	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.7359	18.0199	18.4703	19.1208	19.6841	20.1048	20.2697	20.2468	19.9579	19.2361	18.4037	17.7023	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9312	0.9105	0.8807	0.8173	0.7241	0.5832	0.4446	0.4836	0.6738	0.8365	0.9075	0.9364	(94)
Useful gains	509.7024	557.7967	575.7672	585.8931	540.8308	431.7068	315.2887	322.9581	421.5423	471.9565	485.1347	493.6945	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1305.7780	1271.7336	1157.3180	976.2114	760.8353	518.9595	345.9597	361.9301	554.5528	822.9632	1082.1775	1298.9102	(97)
Space heating kWh													
	592.2802	479.7656	432.6738	281.0292	163.6834	0.0000	0.0000	0.0000	0.0000	261.1490	429.8708	599.0805	(98a)
Space heating requirement - total per year (kWh/year)												3239.5326	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	592.2802	479.7656	432.6738	281.0292	163.6834	0.0000	0.0000	0.0000	0.0000	261.1490	429.8708	599.0805	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3239.5326	
Space heating per m2											(98c) / (4) =	35.6149	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	886.1775	697.6291	715.0496	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.6784	0.7494	0.7194	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	601.1936	522.8145	514.4272	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	794.2071	761.2522	715.7953	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	138.9697	177.3976	149.8178	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)

Space cooling kWh

0.0000	0.0000	0.0000	0.0000	0.0000	34.7424	44.3494	37.4545	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement											116.5463 (107)
Energy for space heating											35.6149 (99)
Energy for space cooling											1.2813 (108)
Total											36.8962 (109)
Fabric Energy Efficiency (TFEE)											36.9 (109)

Full SAP Calculation Printout

Property Reference	78449-15	**Issued on Date**	03/10/2025
Assessment Reference	001	**Prop Type Ref**	Mid
Property	826 Rochdale Road, MANCHESTER, M9 8FA		

SAP Rating	84 B	**DER**	3.62	**TER**	11.44
Environmental	97 A	**% DER < TER**			68.36
CO_2 Emissions (t/year)	0.32	**DFEE**	34.10	**TFEE**	36.90
Compliance Check	See BREL	**% DFEE < TFEE**			7.58
% DPER < TPER	36.04	**DPER**	38.33	**TPER**	59.93

Assessor Details	Mr. Daniel Goddard	**Assessor ID**	CP52-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	41.1800 (1b)	x	2.4800 (2b)	=	102.1264	(1b) - (3b)
First floor	49.7800 (1c)	x	2.7800 (2c)	=	138.3884	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	90.9600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	240.5148	(5)

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2. Ventilation rate

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			m3 per hour	
Number of open chimneys		0 * 80 =	0.0000	(6a)
Number of open flues		0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000	(6d)
Number of flues attached to other heater		0 * 35 =	0.0000	(6e)
Number of blocked chimneys		0 * 20 =	0.0000	(6f)
Number of intermittent extract fans		0 * 10 =	0.0000	(7a)
Number of passive vents		0 * 10 =	0.0000	(7b)
Number of flueless gas fires		0 * 40 =	0.0000	(7c)
		Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		0.0000 / (5) =	0.0000	(8)
Pressure test			Yes	
Pressure Test Method			Blower Door	
Measured/design AP50			5.0000	(17)
Infiltration rate			0.2500	(18)
Number of sides sheltered			2	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.2125	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2709	0.2656	0.2603	0.2338	0.2284	0.2019	0.2019	0.1966	0.2125	0.2284	0.2391	0.2497	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	81.0000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.3659	0.3606	0.3553	0.3287	0.3234	0.2969	0.2969	0.2916	0.3075	0.3234	0.3341	0.3447	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door			4.1400	1.0000	4.1400			(26)
Window			8.5100	0.7752	6.5969			(27)
GF			41.1800	0.0800	3.2944	75.0000	3088.5000	(28a)
Exposed Floor			8.6000	0.1400	1.2040	20.0000	172.0000	(28b)
Main	64.8536	12.6500	52.2036	0.1300	6.7865	9.0000	469.8324	(29a)
PIJ	49.7800		49.7800	0.1300	6.4714	9.0000	448.0200	(30)
Total net area of external elements Aum(A, m2)			164.4136					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		28.4932			(33)
Main dwelling								
Party Wall 1			88.2100	0.0000	0.0000	20.0000	1764.2000	(32)
Timber			96.4800			9.0000	868.3200	(32c)
FF			41.1800			18.0000	741.2400	(32d)
GF			41.1800			9.0000	370.6200	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 7922.7324 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 87.1013 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	8.6300	0.1150	0.9925
E3 Sill	8.6300	0.0170	0.1467
E4 Jamb	28.2000	0.0940	2.6508
E5 Ground floor (normal)	13.8200	0.0670	0.9259
E16 Corner (normal)	4.9600	0.0680	0.3373
E12 Gable (insulation at ceiling level)	11.0000	0.0770	0.8470
E6 Intermediate floor within a dwelling	11.0000	0.0320	0.3520
E17 Corner (inverted - internal area greater than external area)	4.9600	-0.0290	-0.1438
P1 Party wall - Ground floor	15.2800	0.3200	4.8896
E20 Exposed floor (normal)	6.4400	0.0790	0.5088
E21 Exposed floor (inverted)	12.0800	0.0630	0.7610
E18 Party wall between dwellings	21.0400	0.0920	1.9357
P4 Party wall - Roof (insulation at ceiling level)	18.1000	0.1020	1.8462

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 16.0496 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 44.5428 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	29.0444	28.6228	28.2011	26.0928	25.6712	23.5629	23.5629	23.1413	24.4062	25.6712	26.5145	27.3578	(38)
Heat transfer coeff	73.5872	73.1656	72.7439	70.6356	70.2140	68.1057	68.1057	67.6841	68.9490	70.2140	71.0573	71.9006	(39)
Average = Sum(39)m / 12 =												70.5302	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8090	0.8044	0.7997	0.7766	0.7719	0.7487	0.7487	0.7441	0.7580	0.7719	0.7812	0.7905	(40)
HLP (average)												0.7754	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6386 (42)
Hot water usage for mixer showers

68.4610	67.4321	65.9329	63.0644	60.9476	58.5869	57.2450	58.7329	60.3639	62.8986	65.8287	68.1987	(42a)

Hot water usage for baths

29.5637	29.1246	28.5063	27.3663	26.5127	25.5661	25.0549	25.6688	26.3373	27.3502	28.5137	29.4637	(42b)

Hot water usage for other uses

41.6522	40.1376	38.6230	37.1084	35.5937	34.0791	34.0791	35.5937	37.1084	38.6230	40.1376	41.6522	(42c)

Average daily hot water use (litres/day) 128.3946 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	139.6769	136.6944	133.0622	127.5391	123.0540	118.2321	116.3790	119.9955	123.8096	128.8717	134.4799	139.3147	(44)
Energy conte	221.2141	194.6510	204.5117	174.5947	165.6543	145.3802	140.7503	148.5795	152.6696	174.8777	191.5913	218.1331	(45)
Energy content (annual)										Total = Sum(45)m =		2132.6075	

Distribution loss (46)m = 0.15 x (45)m

33.1821	29.1976	30.6768	26.1892	24.8482	21.8070	21.1126	22.2869	22.9004	26.2317	28.7387	32.7200	(46)

Water storage loss:
Store volume 210.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.5800 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.8532 (55)
Total storage loss

26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(56)

If cylinder contains dedicated solar storage

26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(57)
23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Primary loss
Combi loss
Total heat required for water heating calculated for each month

270.9257	239.5518	254.2233	222.7027	215.3659	193.4882	190.4619	198.2911	200.7776	224.5893	239.6993	267.8447	(62)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

WWHRS
PV diverter
Solar input
FGHRS
Output from w/h

270.9257	239.5518	254.2233	222.7027	215.3659	193.4882	190.4619	198.2911	200.7776	224.5893	239.6993	267.8447	(64)

Total per year (kWh/year) = Sum(64)m = 2717.9215 (64)
12Total per year (kWh/year) 2718 (64)
Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)
Heat gains from water heating, kWh/month

113.3230	100.6421	107.7694	96.5391	94.8493	86.8253	86.5688	89.1720	89.2490	97.9161	102.1905	112.2985	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	145.9975	161.6401	145.9975	150.8641	145.9975	150.8641	145.9975	145.9975	150.8641	145.9975	150.8641	145.9975	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	240.8328	243.3319	237.0343	223.6274	206.7036	190.7976	180.1714	177.6723	183.9699	197.3768	214.3007	230.2066	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	(71)
Water heating gains (Table 5)	152.3158	149.7650	144.8514	134.0821	127.4857	120.5907	116.3559	119.8548	123.9570	131.6077	141.9313	150.9389	(72)
Total internal gains	601.7256	617.3165	590.4626	571.1531	542.7662	524.8319	505.1042	506.1041	521.3705	537.5615	569.6755	589.7225	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a	g Specific data	FF Specific data	Access factor	Gains W

					W/m2	or Table 6b		or Table 6c		Table 6d			
East					4.9800	19.6403		0.3000	0.0000	0.7700		22.5938	(76)
West					3.5300	19.6403		0.3000	0.0000	0.7700		16.0153	(80)
Solar gains	38.6090	75.5274	124.3829	181.4051	222.3188	227.5828	216.6681	186.1147	144.6625	89.6197	48.1409	31.7502	(83)
Total gains	640.3346	692.8439	714.8456	752.5582	765.0850	752.4147	721.7724	692.2188	666.0330	627.1812	617.8164	621.4727	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	29.9068	30.0792	30.2535	31.1565	31.3436	32.3139	32.3139	32.5152	31.9186	31.3436	30.9716	30.6084	
alpha	2.9938	3.0053	3.0169	3.0771	3.0896	3.1543	3.1543	3.1677	3.1279	3.0896	3.0648	3.0406	
util living area	0.9265	0.9051	0.8739	0.8005	0.6927	0.5307	0.3996	0.4294	0.6194	0.8096	0.8956	0.9309	(86)
Living	19.2282	19.4614	19.7964	20.2867	20.6516	20.8954	20.9678	20.9595	20.8198	20.3698	19.7744	19.2315	
Non living	18.6144	18.8450	19.1745	19.6594	20.0000	20.2268	20.2808	20.2795	20.1607	19.7473	19.1690	18.6294	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.0936	19.4614	19.7964	20.2867	20.6516	20.8954	20.9678	20.9595	20.8198	20.3698	19.7744	19.4788	(87)
Th 2	20.2455	20.2495	20.2536	20.2737	20.2777	20.2980	20.2980	20.3020	20.2899	20.2777	20.2697	20.2616	(88)
util rest of house	0.9187	0.8951	0.8602	0.7788	0.6590	0.4827	0.3406	0.3702	0.5727	0.7849	0.8832	0.9236	(89)
MIT 2	19.4111	18.8450	19.1745	19.6594	20.0000	20.2268	20.2808	20.2795	20.1607	19.7473	19.1690	18.8577	(90)
Living area fraction										fLA = Living area / (4) =		0.3196	(91)
MIT	19.6292	19.0420	19.3732	19.8599	20.2082	20.4405	20.5004	20.4968	20.3713	19.9462	19.3625	19.0562	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6292	19.0420	19.3732	19.8599	20.2082	20.4405	20.5004	20.4968	20.3713	19.9462	19.3625	19.0562	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9114	0.8762	0.8417	0.7653	0.6556	0.4927	0.3579	0.3870	0.5783	0.7723	0.8653	0.9093	(94)
Useful gains	583.6055	607.0518	601.6955	575.9327	501.6028	370.7506	258.3504	267.9168	385.1931	484.3734	534.5741	565.0785	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1128.0364	1034.7055	936.4503	774.1591	597.3978	397.7702	265.6377	277.2882	432.4032	656.2346	871.3380	1068.1696	(97)
Space heating kWh	405.0565	287.3833	249.0575	142.7230	71.2714	0.0000	0.0000	0.0000	0.0000	127.8647	242.4700	374.2997	(98a)
Space heating requirement - total per year (kWh/year)												1900.1263	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	405.0565	287.3833	249.0575	142.7230	71.2714	0.0000	0.0000	0.0000	0.0000	127.8647	242.4700	374.2997	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1900.1263	
Space heating per m2											(98c) / (4) =	20.8897	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												270.7081	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	405.0565	287.3833	249.0575	142.7230	71.2714	0.0000	0.0000	0.0000	0.0000	127.8647	242.4700	374.2997	(98)
Space heating efficiency (main heating system 1)	270.7081	270.7081	270.7081	270.7081	270.7081	0.0000	0.0000	0.0000	0.0000	270.7081	270.7081	270.7081	(210)
Space heating fuel (main heating system)	149.6285	106.1598	92.0022	52.7221	26.3278	0.0000	0.0000	0.0000	0.0000	47.2334	89.5688	138.2669	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	270.9257	239.5518	254.2233	222.7027	215.3659	193.4882	190.4619	198.2911	200.7776	224.5893	239.6993	267.8447	(64)
Efficiency of water heater												281.1060	(216)
(217)m	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	(217)
Fuel for water heating, kWh/month	96.3785	85.2176	90.4368	79.2237	76.6138	68.8310	67.7545	70.5396	71.4242	79.8949	85.2701	95.2824	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	29.6563	26.7864	29.6563	28.6997	29.6563	28.6997	29.6563	29.6563	28.6997	29.6563	28.6997	29.6563	(231)
Lighting	30.8703	24.7653	22.2984	16.3368	12.6190	10.3098	11.5115	14.9631	19.4355	25.5005	28.8027	31.7283	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	701.9096	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	281.1060	
Water heating fuel used	966.8671	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.1900)		
mechanical ventilation fans (SFP = 1.1900)	349.1794	(230a)
Total electricity for the above, kWh/year	349.1794	(231)
Electricity for lighting (calculated in Appendix L)	249.1413	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2267.0974	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	701.9096	0.1552	108.9520	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	966.8671	0.1410	136.2905	(264)
Space and water heating			245.2426	(265)
Pumps, fans and electric keep-hot	349.1794	0.1387	48.4355	(267)
Energy for lighting	249.1413	0.1443	35.9588	(268)
Total CO2, kg/year			329.6368	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.6200	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	701.9096	1.5746	1105.2587	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	966.8671	1.5212	1470.8230	(278)
Space and water heating			2576.0817	(279)
Pumps, fans and electric keep-hot	349.1794	1.5128	528.2386	(281)
Energy for lighting	249.1413	1.5338	382.1413	(282)
Total Primary energy kWh/year			3486.4616	(286)
Dwelling Primary energy Rate (DPER)			38.3300	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	41.1800	(1b)	x 2.4800	(2b) =	102.1264	(1b) - (3b)
First floor	49.7800	(1c)	x 2.7800	(2c) =	138.3884	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	90.9600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		240.5148	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1247	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3747	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3185	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)

Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4061	0.3982	0.3902	0.3504	0.3424	0.3026	0.3026	0.2946	0.3185	0.3424	0.3583	0.3743 (22b)
Effective ac	0.5825	0.5793	0.5761	0.5614	0.5586	0.5458	0.5458	0.5434	0.5507	0.5586	0.5642	0.5700 (25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			4.1400	1.0000	4.1400			(26)
TER Opening Type			8.5100	1.1450	9.7443			(27)
GF			41.1800	0.1300	5.3534			(28a)
Exposed Floor			8.6000	0.1300	1.1180			(28b)
Main	64.8536	12.6500	52.2036	0.1800	9.3966			(29a)
PIJ	49.7800		49.7800	0.1100	5.4758			(30)
Total net area of external elements Aum(A, m2)			164.4136					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	35.2281			(33)
Main dwelling								
Party Wall 1			88.2100	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	87.1013	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	8.6300	0.0500	0.4315
E3 Sill	8.6300	0.0500	0.4315
E4 Jamb	28.2000	0.0500	1.4100
E5 Ground floor (normal)	13.8200	0.1600	2.2112
E16 Corner (normal)	4.9600	0.0900	0.4464
E12 Gable (insulation at ceiling level)	11.0000	0.0600	0.6600
E6 Intermediate floor within a dwelling	11.0000	0.0000	0.0000
E17 Corner (inverted - internal area greater than external area)	4.9600	-0.0900	-0.4464
P1 Party wall - Ground floor	15.2800	0.0800	1.2224
E20 Exposed floor (normal)	6.4400	0.3200	2.0608
E21 Exposed floor (inverted)	12.0800	0.3200	3.8656
E18 Party wall between dwellings	21.0400	0.0600	1.2624
P4 Party wall - Roof (insulation at ceiling level)	18.1000	0.1200	2.1720

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		15.7274	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	50.9555	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	46.2302	45.9760	45.7269	44.5568	44.3378	43.3187	43.3187	43.1299	43.7112	44.3378	44.7807	45.2438	(38)
Heat transfer coeff	97.1857	96.9316	96.6824	95.5123	95.2934	94.2742	94.2742	94.0855	94.6668	95.2934	95.7363	96.1993	(39)
Average = Sum(39)m / 12 =												95.5112	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0684	1.0657	1.0629	1.0500	1.0476	1.0364	1.0364	1.0344	1.0408	1.0476	1.0525	1.0576	(40)
HLP (average)												1.0500	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy											2.6386	(42)
Hot water usage for mixer showers	68.4610	67.4321	65.9329	63.0644	60.9476	58.5869	57.2450	58.7329	60.3639	62.8986	65.8287	68.1987 (42a)
Hot water usage for baths	29.5637	29.1246	28.5063	27.3663	26.5127	25.5661	25.0549	25.6688	26.3373	27.3502	28.5137	29.4637 (42b)
Hot water usage for other uses	41.6522	40.1376	38.6230	37.1084	35.5937	34.0791	34.0791	35.5937	37.1084	38.6230	40.1376	41.6522 (42c)
Average daily hot water use (litres/day)												128.3946 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	139.6769	136.6944	133.0622	127.5391	123.0540	118.2321	116.3790	119.9955	123.8096	128.8717	134.4799	139.3147	(44)
Energy conte	221.2141	194.6510	204.5117	174.5947	165.6543	145.3802	140.7503	148.5795	152.6696	174.8777	191.5913	218.1331	(45)
Energy content (annual)										Total = Sum(45)m =		2132.6075	
Distribution loss (46)m = 0.15 x (45)m	33.1821	29.1976	30.6768	26.1892	24.8482	21.8070	21.1126	22.2869	22.9004	26.2317	28.7387	32.7200	(46)
Water storage loss:													
Store volume												210.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7016	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.9188	(55)
Total storage loss	28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842	(56)
If cylinder contains dedicated solar storage	28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	272.9607	241.3898	256.2583	224.6720	217.4009	195.4575	192.4969	200.3261	202.7469	226.6243	241.6687	269.8797	(62)
WWHRS	-31.2975	-27.6798	-28.9847	-24.0004	-22.3675	-19.1401	-17.9408	-19.0782	-19.8031	-23.3456	-26.4477	-30.7179	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	241.6632	213.7101	227.2737	200.6716	195.0334	176.3175	174.5562	181.2479	182.9439	203.2787	215.2209	239.1618	(64)
										Total per year (kWh/year) = Sum(64)m =		2451.0786	(64)
12Total per year (kWh/year)												2451	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	114.9510	102.1125	109.3974	98.1146	96.4773	88.4008	88.1968	90.7999	90.8245	99.5441	103.7660	113.9265	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

(66)m	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	142.2156	157.4530	142.2156	146.9561	142.2156	146.9561	142.2156	142.2156	146.9561	142.2156	146.9561	142.2156	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	240.8328	243.3319	237.0343	223.6274	206.7036	190.7976	180.1714	177.6723	183.9699	197.3768	214.3007	230.2066	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	(71)
Water heating gains (Table 5)													
	154.5040	151.9532	147.0395	136.2703	129.6738	122.7789	118.5440	122.0429	126.1452	133.7959	144.1194	153.1270	(72)
Total internal gains													
	603.1319	618.3176	591.8689	572.4333	544.1725	523.1121	503.5105	504.5103	519.6507	538.9678	570.9557	591.1288	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	4.9800	19.6403	0.6300	0.7000	0.7700	29.8916	(76)
West	3.5300	19.6403	0.6300	0.7000	0.7700	21.1882	(80)

Solar gains	51.0797	99.9228	164.5586	239.9990	294.1277	301.0921	286.6519	246.2298	191.3885	118.5668	63.6904	42.0055	(83)
Total gains	654.2116	718.2404	756.4276	812.4323	838.3003	824.2042	790.1625	750.7401	711.0392	657.5346	634.6461	633.1343	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	22.6449	22.7043	22.7628	23.0416	23.0946	23.3442	23.3442	23.3911	23.2474	23.0946	22.9877	22.8771	
alpha	2.5097	2.5136	2.5175	2.5361	2.5396	2.5563	2.5563	2.5594	2.5498	2.5396	2.5325	2.5251	
util living area													
	0.9363	0.9179	0.8900	0.8294	0.7371	0.6002	0.4715	0.5071	0.6872	0.8450	0.9135	0.9408	(86)
MIT	18.4665	18.7376	19.1692	19.7832	20.3219	20.7241	20.8928	20.8676	20.5829	19.8994	19.1053	18.4305	(87)
Th 2	20.0267	20.0290	20.0312	20.0418	20.0438	20.0531	20.0531	20.0548	20.0495	20.0438	20.0398	20.0356	(88)
util rest of house													
	0.9284	0.9077	0.8757	0.8060	0.6983	0.5374	0.3858	0.4222	0.6306	0.8190	0.9010	0.9333	(89)
MIT 2	17.0633	17.4054	17.9489	18.7154	19.3635	19.8213	19.9856	19.9670	19.6760	18.8716	17.8806	17.0230	(90)
Living area fraction										fLA = Living area / (4) =		0.3196	(91)
MIT	17.5118	17.8312	18.3389	19.0566	19.6698	20.1098	20.2755	20.2548	19.9659	19.2001	18.2720	17.4728	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.5118	17.8312	18.3389	19.0566	19.6698	20.1098	20.2755	20.2548	19.9659	19.2001	18.2720	17.4728	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9004	0.8773	0.8442	0.7775	0.6812	0.5414	0.4069	0.4412	0.6251	0.7913	0.8712	0.9063	(94)
Useful gains	589.0216	630.1383	638.5494	631.6864	571.0784	446.2550	321.5222	331.1952	444.4610	520.3070	552.8988	573.8331	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1283.9967	1253.4418	1144.6149	970.0843	759.4665	519.4329	346.5070	362.6828	555.3014	819.5308	1069.5680	1276.8325	(97)
Space heating kWh													
	517.0614	418.8600	376.5127	243.6465	140.1607	0.0000	0.0000	0.0000	0.0000	222.6225	372.0018	523.0315	(98a)
Space heating requirement - total per year (kWh/year)												2813.8972	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	517.0614	418.8600	376.5127	243.6465	140.1607	0.0000	0.0000	0.0000	0.0000	222.6225	372.0018	523.0315	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2813.8972	
Space heating per m2											(98c) / (4) =	30.9355	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	517.0614	418.8600	376.5127	243.6465	140.1607	0.0000	0.0000	0.0000	0.0000	222.6225	372.0018	523.0315	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	560.1966	453.8028	407.9227	263.9724	151.8534	0.0000	0.0000	0.0000	0.0000	241.1945	403.0355	566.6647	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	241.6632	213.7101	227.2737	200.6716	195.0334	176.3175	174.5562	181.2479	182.9439	203.2787	215.2209	239.1618	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.7207	85.5407	85.1837	84.4960	83.3316	79.8000	79.8000	79.8000	79.8000	84.2641	85.2751	85.7649	(217)
Fuel for water heating, kWh/month													
	281.9193	249.8345	266.8041	237.4923	234.0450	220.9492	218.7421	227.1276	229.2530	241.2400	252.3842	278.8574	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)

Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	29.5496	23.7058	21.3444	15.6378	12.0791	9.8687	11.0190	14.3229	18.6040	24.4095	27.5704	30.3709	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-38.9812	-55.1702	-79.5760	-89.7571	-96.9883	-90.5718	-89.4598	-84.3870	-75.4216	-63.2498	-42.9366	-33.6769	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-21.3144	-44.9402	-89.5251	-134.7575	-178.4789	-179.4591	-177.3409	-150.0006	-109.7478	-64.3537	-28.4842	-16.8460	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	3048.6426	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2938.6486	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	238.4821	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-2035.4247	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	4276.3487	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3048.6426	0.2100	640.2150	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2938.6486	0.2100	617.1162	(264)
Space and water heating			1257.3312	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	238.4821	0.1443	34.4203	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-840.1762	0.1345	-113.0202	
PV Unit electricity exported	-1195.2485	0.1258	-150.3985	
Total			-263.4187	(269)
Total CO2, kg/year			1040.2621	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.4400	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	3048.6426	1.1300	3444.9662	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2938.6486	1.1300	3320.6730	(278)
Space and water heating			6765.6391	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	238.4821	1.5338	365.7919	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-840.1762	1.4972	-1257.8767	
PV Unit electricity exported	-1195.2485	0.4619	-552.0620	
Total			-1809.9387	(283)
Total Primary energy kWh/year			5451.5931	(286)
Target Primary Energy Rate (TPER)			59.9300	(287)

Full SAP Calculation Printout

Property Reference	78449-15	**Issued on Date**	03/10/2025
Assessment Reference	001	**Prop Type Ref**	Mid
Property	826 Rochdale Road, MANCHESTER, M9 8FA		

SAP Rating	84 B	**DER**	3.62	**TER**	11.44
Environmental	97 A	**% DER < TER**			68.36
CO_2 Emissions (t/year)	0.32	**DFEE**	34.10	**TFEE**	36.90
Compliance Check	See BREL	**% DFEE < TFEE**			7.58
% DPER < TPER	36.04	**DPER**	38.33	**TPER**	59.93

Assessor Details	Mr. Daniel Goddard	**Assessor ID**	CP52-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	41.1800 (1b)	x	2.4800 (2b)	=	102.1264	(1b) - (3b)
First floor	49.7800 (1c)	x	2.7800 (2c)	=	138.3884	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	90.9600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	240.5148	(5)

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2. Ventilation rate

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				m3 per hour	
Number of open chimneys			0 * 80 =	0.0000	(6a)
Number of open flues			0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire			0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler			0 * 20 =	0.0000	(6d)
Number of flues attached to other heater			0 * 35 =	0.0000	(6e)
Number of blocked chimneys			0 * 20 =	0.0000	(6f)
Number of intermittent extract fans			0 * 10 =	0.0000	(7a)
Number of passive vents			0 * 10 =	0.0000	(7b)
Number of flueless gas fires			0 * 40 =	0.0000	(7c)
				Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =			0.0000 / (5) =	0.0000	(8)
Pressure test				Yes	
Pressure Test Method				Blower Door	
Measured/design AP50				5.0000	(17)
Infiltration rate				0.2500	(18)
Number of sides sheltered				2	(19)
Shelter factor			(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =	0.2125	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2709	0.2656	0.2603	0.2338	0.2284	0.2019	0.2019	0.1966	0.2125	0.2284	0.2391	0.2497	(22b)

Balanced mechanical ventilation with heat recovery		
If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =		81.0000 (23c)

Effective ac	0.3659	0.3606	0.3553	0.3287	0.3234	0.2969	0.2969	0.2916	0.3075	0.3234	0.3341	0.3447	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door			4.1400	1.0000	4.1400			(26)
Window			8.5100	0.7752	6.5969			(27)
GF			41.1800	0.0800	3.2944	75.0000	3088.5000	(28a)
Exposed Floor			8.6000	0.1400	1.2040	20.0000	172.0000	(28b)
Main	64.8536	12.6500	52.2036	0.1300	6.7865	9.0000	469.8324	(29a)
PIJ	49.7800		49.7800	0.1300	6.4714	9.0000	448.0200	(30)
Total net area of external elements Aum(A, m2)			164.4136					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		28.4932			(33)
Main dwelling								
Party Wall 1			88.2100	0.0000	0.0000	20.0000	1764.2000	(32)
Timber			96.4800			9.0000	868.3200	(32c)
FF			41.1800			18.0000	741.2400	(32d)
GF			41.1800			9.0000	370.6200	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	7922.7324	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		87.1013	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	8.6300	0.1150	0.9925
E3 Sill	8.6300	0.0170	0.1467
E4 Jamb	28.2000	0.0940	2.6508
E5 Ground floor (normal)	13.8200	0.0670	0.9259
E16 Corner (normal)	4.9600	0.0680	0.3373
E12 Gable (insulation at ceiling level)	11.0000	0.0770	0.8470
E6 Intermediate floor within a dwelling	11.0000	0.0320	0.3520
E17 Corner (inverted - internal area greater than external area)	4.9600	-0.0290	-0.1438
P1 Party wall - Ground floor	15.2800	0.3200	4.8896
E20 Exposed floor (normal)	6.4400	0.0790	0.5088
E21 Exposed floor (inverted)	12.0800	0.0630	0.7610
E18 Party wall between dwellings	21.0400	0.0920	1.9357
P4 Party wall - Roof (insulation at ceiling level)	18.1000	0.1020	1.8462

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		16.0496	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	44.5428	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	29.0444	28.6228	28.2011	26.0928	25.6712	23.5629	23.5629	23.1413	24.4062	25.6712	26.5145	27.3578	(38)
Heat transfer coeff	73.5872	73.1656	72.7439	70.6356	70.2140	68.1057	68.1057	67.6841	68.9490	70.2140	71.0573	71.9006	(39)
Average = Sum(39)m / 12 =												70.5302	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8090	0.8044	0.7997	0.7766	0.7719	0.7487	0.7487	0.7441	0.7580	0.7719	0.7812	0.7905	(40)
HLP (average)												0.7754	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.6386	(42)
Hot water usage for mixer showers	68.4610	67.4321	65.9329	63.0644	60.9476	58.5869	57.2450	58.7329	60.3639	62.8986	65.8287	68.1987	(42a)
Hot water usage for baths	29.5637	29.1246	28.5063	27.3663	26.5127	25.5661	25.0549	25.6688	26.3373	27.3502	28.5137	29.4637	(42b)
Hot water usage for other uses	41.6522	40.1376	38.6230	37.1084	35.5937	34.0791	34.0791	35.5937	37.1084	38.6230	40.1376	41.6522	(42c)
Average daily hot water use (litres/day)												128.3946	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	139.6769	136.6944	133.0622	127.5391	123.0540	118.2321	116.3790	119.9955	123.8096	128.8717	134.4799	139.3147	(44)
Energy conte	221.2141	194.6510	204.5117	174.5947	165.6543	145.3802	140.7503	148.5795	152.6696	174.8777	191.5913	218.1331	(45)
Energy content (annual)										Total = Sum(45)m =		2132.6075	
Distribution loss (46)m = 0.15 x (45)m	33.1821	29.1976	30.6768	26.1892	24.8482	21.8070	21.1126	22.2869	22.9004	26.2317	28.7387	32.7200	(46)
Water storage loss:													
Store volume												210.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5800	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8532	(55)
Total storage loss	26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(56)
If cylinder contains dedicated solar storage	26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	270.9257	239.5518	254.2233	222.7027	215.3659	193.4882	190.4619	198.2911	200.7776	224.5893	239.6993	267.8447	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	270.9257	239.5518	254.2233	222.7027	215.3659	193.4882	190.4619	198.2911	200.7776	224.5893	239.6993	267.8447	(64)
										Total per year (kWh/year) = Sum(64)m =		2717.9215	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	113.3230	100.6421	107.7694	96.5391	94.8493	86.8253	86.5688	89.1720	89.2490	97.9161	102.1905	112.2985	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	35.2685	31.3252	25.4754	19.2865	14.4169	12.1713	13.1516	17.0949	22.9447	29.1336	34.0032	36.2488	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	359.4520	363.1820	353.7825	333.7722	308.5128	284.7725	268.9125	265.1825	274.5820	294.5923	319.8517	343.5920	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	(71)
Water heating gains (Table 5)	152.3158	149.7650	144.8514	134.0821	127.4857	120.5907	116.3559	119.8548	123.9570	131.6077	141.9313	150.9389	(72)
Total internal gains	653.2794	650.5153	630.3524	593.3839	556.6585	523.7777	504.6631	508.3753	527.7268	561.5767	602.0293	637.0228	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W

East				4.9800		19.6403		0.3000		0.0000		0.7700		22.5938 (76)
West				3.5300		19.6403		0.3000		0.0000		0.7700		16.0153 (80)
Solar gains	38.6090	75.5274	124.3829	181.4051	222.3188	227.5828	216.6681	186.1147	144.6625	89.6197	48.1409	31.7502	(83)
Total gains	691.8885	726.0427	754.7353	774.7891	778.9772	751.3605	721.3312	694.4900	672.3893	651.1964	650.1702	668.7729	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	29.9068	30.0792	30.2535	31.1565	31.3436	32.3139	32.3139	32.5152	31.9186	31.3436	30.9716	30.6084	
alpha	2.9938	3.0053	3.0169	3.0771	3.0896	3.1543	3.1543	3.1677	3.1279	3.0896	3.0648	3.0406	
util living area	0.9130	0.8953	0.8598	0.7904	0.6853	0.5313	0.3998	0.4281	0.6153	0.7969	0.8839	0.9186	(86)
Living	19.3352	19.5255	19.8642	20.3151	20.6625	20.8951	20.9678	20.9598	20.8232	20.4014	19.8348	19.3320	
Non living	18.7181	18.9066	19.2387	19.6852	20.0091	20.2266	20.2808	20.2797	20.1633	19.7757	19.2264	18.7270	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.1483	19.5255	19.8642	20.3151	20.6625	20.8951	20.9678	20.9598	20.8232	20.4014	19.8348	19.5653	(87)
Th 2	20.2455	20.2495	20.2536	20.2737	20.2777	20.2980	20.2980	20.3020	20.2899	20.2777	20.2697	20.2616	(88)
util rest of house	0.9039	0.8846	0.8451	0.7682	0.6514	0.4833	0.3408	0.3691	0.5687	0.7713	0.8706	0.9102	(89)
MIT 2	19.4642	18.9066	19.2387	19.6852	20.0091	20.2266	20.2808	20.2797	20.1633	19.7757	19.2264	18.9416	(90)
Living area fraction										fLA = Living area / (4) =		0.3196	(91)
MIT	19.6828	19.1044	19.4386	19.8865	20.2180	20.4402	20.5003	20.4970	20.3742	19.9756	19.4208	19.1409	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6828	19.1044	19.4386	19.8865	20.2180	20.4402	20.5003	20.4970	20.3742	19.9756	19.4208	19.1409	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8965	0.8654	0.8269	0.7553	0.6485	0.4933	0.3581	0.3859	0.5745	0.7596	0.8526	0.8952	(94)
Useful gains	620.2474	628.3480	624.1182	585.2252	505.1566	370.6474	258.3365	268.0102	386.2635	494.6223	554.3581	598.7034	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1131.9783	1039.2719	941.2033	776.0376	598.0796	397.7520	265.6354	277.3043	432.5995	658.3016	875.4841	1074.2629	(97)
Space heating kWh	380.7278	276.1409	235.9113	137.3849	69.1347	0.0000	0.0000	0.0000	0.0000	121.7775	231.2107	353.8162	(98a)
Space heating requirement - total per year (kWh/year)												1806.1040	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	380.7278	276.1409	235.9113	137.3849	69.1347	0.0000	0.0000	0.0000	0.0000	121.7775	231.2107	353.8162	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1806.1040	
Space heating per m2											(98c) / (4) =	19.8560	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												270.7081	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	380.7278	276.1409	235.9113	137.3849	69.1347	0.0000	0.0000	0.0000	0.0000	121.7775	231.2107	353.8162	(98)
Space heating efficiency (main heating system 1)	270.7081	270.7081	270.7081	270.7081	270.7081	0.0000	0.0000	0.0000	0.0000	270.7081	270.7081	270.7081	(210)
Space heating fuel (main heating system)	140.6414	102.0069	87.1460	50.7502	25.5385	0.0000	0.0000	0.0000	0.0000	44.9848	85.4096	130.7003	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	270.9257	239.5518	254.2233	222.7027	215.3659	193.4882	190.4619	198.2911	200.7776	224.5893	239.6993	267.8447	(64)
Efficiency of water heater												281.1060	(216)
(217)m	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	(217)
Fuel for water heating, kWh/month	96.3785	85.2176	90.4368	79.2237	76.6138	68.8310	67.7545	70.5396	71.4242	79.8949	85.2701	95.2824	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	29.6563	26.7864	29.6563	28.6997	29.6563	28.6997	29.6563	29.6563	28.6997	29.6563	28.6997	29.6563	(231)
Lighting	30.8703	24.7653	22.2984	16.3368	12.6190	10.3098	11.5115	14.9631	19.4355	25.5005	28.8027	31.7283	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													

Space heating fuel - main system 1	667.1777	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	281.1060	
Water heating fuel used	966.8671	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.1900)		
mechanical ventilation fans (SFP = 1.1900)	349.1794	(230a)
Total electricity for the above, kWh/year	349.1794	(231)
Electricity for lighting (calculated in Appendix L)	249.1413	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2232.3655	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	667.1777	16.4900	110.0176	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	966.8671	16.4900	159.4364	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	349.1794	16.4900	57.5797	(249)
Energy for lighting	249.1413	16.4900	41.0834	(250)
Additional standing charges			0.0000	(251)
Total energy cost			368.1171	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.9747	(257)
SAP value		84.1999	
SAP rating (Section 12)		84	(258)
SAP band		B	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	667.1777	0.1552	103.5263	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	966.8671	0.1410	136.2905	(264)
Space and water heating			239.8168	(265)
Pumps, fans and electric keep-hot	349.1794	0.1387	48.4355	(267)
Energy for lighting	249.1413	0.1443	35.9588	(268)
Total CO2, kg/year			324.2111	(272)
CO2 emissions per m2			3.5600	(273)
EI value			96.8046	
EI rating			97	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	41.1800 (1b)	x	2.4800 (2b)	=	102.1264	(1b) - (3b)
First floor	49.7800 (1c)	x	2.7800 (2c)	=	138.3884	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 90.9600						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		240.5148	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.2500 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2125 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.6000	4.5000	4.5000	4.1000	4.2000	3.7000	3.5000	3.5000	3.7000	4.1000	4.1000	4.2000	(22)
Wind factor	1.1500	1.1250	1.1250	1.0250	1.0500	0.9250	0.8750	0.8750	0.9250	1.0250	1.0250	1.0500	(22a)
Adj infilt rate	0.2444	0.2391	0.2391	0.2178	0.2231	0.1966	0.1859	0.1859	0.1966	0.2178	0.2178	0.2231	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	81.0000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.3394	0.3341	0.3341	0.3128	0.3181	0.2916	0.2809	0.2809	0.2916	0.3128	0.3128	0.3181	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door			4.1400	1.0000	4.1400			(26)
Window			8.5100	0.7752	6.5969			(27)
GF			41.1800	0.0800	3.2944	75.0000	3088.5000	(28a)
Exposed Floor			8.6000	0.1400	1.2040	20.0000	172.0000	(28b)
Main	64.8536	12.6500	52.2036	0.1300	6.7865	9.0000	469.8324	(29a)
PIJ	49.7800		49.7800	0.1300	6.4714	9.0000	448.0200	(30)
Total net area of external elements Aum(A, m2)			164.4136					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	28.4932			(33)
Main dwelling								
Party Wall 1			88.2100	0.0000	0.0000	20.0000	1764.2000	(32)
Timber			96.4800			9.0000	868.3200	(32c)
FF			41.1800			18.0000	741.2400	(32d)
GF			41.1800			9.0000	370.6200	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) =	7922.7324 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	87.1013 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	8.6300	0.1150	0.9925
E3 Sill	8.6300	0.0170	0.1467
E4 Jamb	28.2000	0.0940	2.6508
E5 Ground floor (normal)	13.8200	0.0670	0.9259
E16 Corner (normal)	4.9600	0.0680	0.3373
E12 Gable (insulation at ceiling level)	11.0000	0.0770	0.8470
E6 Intermediate floor within a dwelling	11.0000	0.0320	0.3520
E17 Corner (inverted - internal area greater than external area)	4.9600	-0.0290	-0.1438
P1 Party wall - Ground floor	15.2800	0.3200	4.8896
E20 Exposed floor (normal)	6.4400	0.0790	0.5088
E21 Exposed floor (inverted)	12.0800	0.0630	0.7610
E18 Party wall between dwellings	21.0400	0.0920	1.9357
P4 Party wall - Roof (insulation at ceiling level)	18.1000	0.1020	1.8462

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		16.0496 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	44.5428 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	26.9362	26.5145	26.5145	24.8279	25.2495	23.1413	22.2980	22.2980	23.1413	24.8279	24.8279	25.2495	(38)
Heat transfer coeff	71.4789	71.0573	71.0573	69.3707	69.7923	67.6841	66.8408	66.8408	67.6841	69.3707	69.3707	69.7923	(39)
Average = Sum(39)m / 12 =												69.1950	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7858	0.7812	0.7812	0.7627	0.7673	0.7441	0.7348	0.7348	0.7441	0.7627	0.7627	0.7673	(40)
HLP (average)												0.7607	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.6386 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	68.4610	67.4321	65.9329	63.0644	60.9476	58.5869	57.2450	58.7329	60.3639	62.8986	65.8287	68.1987	(42a)
Hot water usage for baths	29.5637	29.1246	28.5063	27.3663	26.5127	25.5661	25.0549	25.6688	26.3373	27.3502	28.5137	29.4637	(42b)
Hot water usage for other uses	41.6522	40.1376	38.6230	37.1084	35.5937	34.0791	34.0791	35.5937	37.1084	38.6230	40.1376	41.6522	(42c)
Average daily hot water use (litres/day)												128.3946	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	139.6769	136.6944	133.0622	127.5391	123.0540	118.2321	116.3790	119.9955	123.8096	128.8717	134.4799	139.3147	(44)
Energy conte	221.2141	194.6510	204.5117	174.5947	165.6543	145.3802	140.7503	148.5795	152.6696	174.8777	191.5913	218.1331	(45)
Energy content (annual)										Total = Sum(45)m =		2132.6075	
Distribution loss (46)m = 0.15 x (45)m	33.1821	29.1976	30.6768	26.1892	24.8482	21.8070	21.1126	22.2869	22.9004	26.2317	28.7387	32.7200	(46)

Water storage loss:	
Store volume	210.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):	1.5800 (48)
Temperature factor from Table 2b	0.5400 (49)
Enter (49) or (54) in (55)	0.8532 (55)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Total storage loss	26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(56)
If cylinder contains dedicated solar storage	26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

	270.9257	239.5518	254.2233	222.7027	215.3659	193.4882	190.4619	198.2911	200.7776	224.5893	239.6993	267.8447	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	270.9257	239.5518	254.2233	222.7027	215.3659	193.4882	190.4619	198.2911	200.7776	224.5893	239.6993	267.8447	(64)
											Total per year (kWh/year) = Sum(64)m =	2717.9215	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
											Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	0.0000	(64a)
Heat gains from water heating, kWh/month													
	113.3230	100.6421	107.7694	96.5391	94.8493	86.8253	86.5688	89.1720	89.2490	97.9161	102.1905	112.2985	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	35.2685	31.3252	25.4754	19.2865	14.4169	12.1713	13.1516	17.0949	22.9447	29.1336	34.0032	36.2488	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	359.4520	363.1820	353.7825	333.7722	308.5128	284.7725	268.9125	265.1825	274.5820	294.5923	319.8517	343.5920	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	(71)
Water heating gains (Table 5)													
	152.3158	149.7650	144.8514	134.0821	127.4857	120.5907	116.3559	119.8548	123.9570	131.6077	141.9313	150.9389	(72)
Total internal gains													
	653.2794	650.5153	630.3524	593.3839	556.6585	523.7777	504.6631	508.3753	527.7268	561.5767	602.0293	637.0228	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	4.9800	16.6187	0.3000	0.0000	0.7700	19.1178	(76)
West	3.5300	16.6187	0.3000	0.0000	0.7700	13.5514	(80)

Solar gains	32.6692	67.1355	116.6090	172.9395	207.2659	216.2037	201.7650	170.7039	137.1149	82.8303	42.3057	28.7264	(83)
Total gains	685.9486	717.6508	746.9614	766.3235	763.9244	739.9813	706.4281	679.0793	664.8417	644.4070	644.3350	665.7491	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	30.7889	30.9716	30.9716	31.7246	31.5330	32.5152	32.9254	32.9254	32.5152	31.7246	31.7246	31.5330	
alpha	3.0526	3.0648	3.0648	3.1150	3.1022	3.1677	3.1950	3.1950	3.1677	3.1150	3.1150	3.1022	
util living area													
	0.9076	0.8893	0.8555	0.7783	0.6637	0.5085	0.4012	0.4240	0.6138	0.7911	0.8761	0.9127	(86)
Living	19.4724	19.6531	19.9361	20.3878	20.7157	20.9144	20.9692	20.9630	20.8310	20.4375	19.9418	19.4757	
Non living	18.8674	19.0462	19.3204	19.7636	20.0604	20.2457	20.2936	20.2899	20.1808	19.8160	19.3425	18.8828	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.2185	19.6531	19.9361	20.3878	20.7157	20.9144	20.9692	20.9630	20.8310	20.4375	19.9418	19.6889	(87)
Th 2	20.2656	20.2697	20.2697	20.2858	20.2818	20.3020	20.3102	20.3102	20.3020	20.2858	20.2858	20.2818	(88)
util rest of house													
	0.8980	0.8780	0.8404	0.7549	0.6271	0.4584	0.3429	0.3646	0.5678	0.7648	0.8618	0.9037	(89)
MIT 2	19.5503	19.0462	19.3204	19.7636	20.0604	20.2457	20.2936	20.2899	20.1808	19.8160	19.3425	19.0785	(90)
Living area fraction										fLA = Living area / (4) =		0.3196	(91)
MIT	19.7639	19.2402	19.5172	19.9631	20.2698	20.4594	20.5095	20.5050	20.3886	20.0147	19.5340	19.2736	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7639	19.2402	19.5172	19.9631	20.2698	20.4594	20.5095	20.5050	20.3886	20.0147	19.5340	19.2736	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8908	0.8595	0.8230	0.7434	0.6265	0.4700	0.3600	0.3818	0.5738	0.7539	0.8447	0.8890	(94)
Useful gains	611.0418	616.8058	614.7283	569.7172	478.5917	347.8123	254.3424	259.2418	381.4628	485.8323	544.2386	591.8804	(95)
Ext temp.	4.7000	5.3000	6.7000	9.3000	12.3000	15.0000	16.6000	16.5000	14.1000	10.8000	7.5000	4.6000	(96)
Heat loss rate W													
	1076.7501	990.5516	910.7546	739.7053	556.2338	369.5173	261.3146	267.6971	425.6384	639.2266	834.8081	1024.1033	(97)
Space heating kWh													
	346.4870	251.1572	220.2435	122.3914	57.7657	0.0000	0.0000	0.0000	0.0000	114.1253	209.2101	321.5739	(98a)
Space heating requirement - total per year (kWh/year)												1642.9541	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	346.4870	251.1572	220.2435	122.3914	57.7657	0.0000	0.0000	0.0000	0.0000	114.1253	209.2101	321.5739	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1642.9541	
Space heating per m2											(98c) / (4) =	18.0624	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)

Efficiency of main space heating system 1 (in %)												269.7489	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	346.4870	251.1572	220.2435	122.3914	57.7657	0.0000	0.0000	0.0000	0.0000	114.1253	209.2101	321.5739	(98)
Space heating efficiency (main heating system 1)													
	269.7489	269.7489	269.7489	269.7489	269.7489	0.0000	0.0000	0.0000	0.0000	269.7489	269.7489	269.7489	(210)
Space heating fuel (main heating system)													
	128.4480	93.1078	81.6476	45.3723	21.4146	0.0000	0.0000	0.0000	0.0000	42.3080	77.5573	119.2123	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	270.9257	239.5518	254.2233	222.7027	215.3659	193.4882	190.4619	198.2911	200.7776	224.5893	239.6993	267.8447	(64)
Efficiency of water heater												281.4160	(216)
(217)m	281.4160	281.4160	281.4160	281.4160	281.4160	281.4160	281.4160	281.4160	281.4160	281.4160	281.4160	281.4160	(217)
Fuel for water heating, kWh/month													
	96.2723	85.1237	90.3372	79.1365	76.5294	68.7552	67.6798	70.4619	71.3455	79.8069	85.1761	95.1775	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	29.6563	26.7864	29.6563	28.6997	29.6563	28.6997	29.6563	29.6563	28.6997	29.6563	28.6997	29.6563	(231)
Lighting	30.8703	24.7653	22.2984	16.3368	12.6190	10.3098	11.5115	14.9631	19.4355	25.5005	28.8027	31.7283	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												609.0679	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												281.4160	
Water heating fuel used												965.8020	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.1900)													
mechanical ventilation fans (SFP = 1.1900)												349.1794	(230a)
Total electricity for the above, kWh/year												349.1794	(231)
Electricity for lighting (calculated in Appendix L)												249.1413	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												2173.1906	(238)

10a. Fuel costs - using BEDF prices (583)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	609.0679	28.4300	173.1580	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	965.8020	28.4300	274.5775	(247)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(247a)
Pumps, fans and electric keep-hot	349.1794	28.4300	99.2717	(249)
Energy for lighting	249.1413	28.4300	70.8309	(250)
Additional standing charges			0.0000	(251)
Total energy cost			617.8381	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	609.0679	0.1552	94.5380	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	965.8020	0.1410	136.1404	(264)
Space and water heating			230.6784	(265)
Pumps, fans and electric keep-hot	349.1794	0.1387	48.4355	(267)
Energy for lighting	249.1413	0.1443	35.9588	(268)
Total CO2, kg/year			315.0726	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	609.0679	1.5746	959.0631	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	965.8020	1.5212	1469.2027	(278)
Space and water heating			2428.2658	(279)

Pumps, fans and electric keep-hot	349.1794	1.5128	528.2386 (281)
Energy for lighting	249.1413	1.5338	382.1413 (282)
Total Primary energy kWh/year			3338.6457 (286)

SAP 10 EPC IMPROVEMENTS

001

Current energy efficiency rating: B 84
Current environmental impact rating: A 97

N Solar water heating		Recommended
U Solar photovoltaic panels		Recommended
V2 Wind turbine		Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
N Solar water heating	+ 1.4	-£ 53	-23 kg (7.2%)
U Solar photovoltaic panels	+ 8.2	-£ 277	-207 kg (70.8%)

	Typical annual savings		Energy efficiency	Environmental impact
Recommended measures				
Solar water heating	£53	0.25 kg/m²	B 86	A 97
Solar photovoltaic panels	£277	2.27 kg/m²	A 94	A 99
Total Savings	£330	2.52 kg/m²		

Potential energy efficiency rating: A 94
Potential environmental impact rating: A 99

Fuel prices for cost data on this page from database revision number 583 TEST (01 Oct 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, West Pennines (England)):

	Current	Potential	Saving
Electricity	£618	£565	£53
Space heating	£272	£298	-£26
Water heating	£275	£196	£78
Lighting	£71	£71	£0
Generated (PV)	-£0	-£277	£277
Total cost of fuels	£618	£288	£330
Total cost of uses	£618	£288	£329
Delivered energy	24 kWh/m²	4 kWh/m²	20 kWh/m²
Carbon dioxide emissions	0.3 tonnes	0.1 tonnes	0.2 tonnes
CO2 emissions per m²	3 kg/m²	1 kg/m²	3 kg/m²
Primary energy	37 kWh/m²	16 kWh/m²	20 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	41.1800	(1b)	x 2.4800	(2b) =	102.1264	(1b) - (3b)
First floor	49.7800	(1c)	x 2.7800	(2c) =	138.3884	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	90.9600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		240.5148	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.2500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2125	(21)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													
	0.2709	0.2656	0.2603	0.2338	0.2284	0.2019	0.2019	0.1966	0.2125	0.2284	0.2391	0.2497	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	81.0000	(23c)

Effective ac	0.3659	0.3606	0.3553	0.3287	0.3234	0.2969	0.2969	0.2916	0.3075	0.3234	0.3341	0.3447	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Door			4.1400	1.0000	4.1400			(26)
Window			8.5100	0.7752	6.5969			(27)
GF			41.1800	0.0800	3.2944	75.0000	3088.5000	(28a)
Exposed Floor			8.6000	0.1400	1.2040	20.0000	172.0000	(28b)
Main	64.8536	12.6500	52.2036	0.1300	6.7865	9.0000	469.8324	(29a)
PIJ	49.7800		49.7800	0.1300	6.4714	9.0000	448.0200	(30)
Total net area of external elements Aum(A, m2)			164.4136					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	28.4932			(33)
Main dwelling								
Party Wall 1			88.2100	0.0000	0.0000	20.0000	1764.2000	(32)
Timber			96.4800			9.0000	868.3200	(32c)
FF			41.1800			18.0000	741.2400	(32d)
GF			41.1800			9.0000	370.6200	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 7922.7324	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	87.1013	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	8.6300	0.1150	0.9925
E3 Sill	8.6300	0.0170	0.1467
E4 Jamb	28.2000	0.0940	2.6508
E5 Ground floor (normal)	13.8200	0.0670	0.9259
E16 Corner (normal)	4.9600	0.0680	0.3373
E12 Gable (insulation at ceiling level)	11.0000	0.0770	0.8470
E6 Intermediate floor within a dwelling	11.0000	0.0320	0.3520
E17 Corner (inverted - internal area greater than external area)	4.9600	-0.0290	-0.1438
P1 Party wall - Ground floor	15.2800	0.3200	4.8896
E20 Exposed floor (normal)	6.4400	0.0790	0.5088
E21 Exposed floor (inverted)	12.0800	0.0630	0.7610
E18 Party wall between dwellings	21.0400	0.0920	1.9357
P4 Party wall - Roof (insulation at ceiling level)	18.1000	0.1020	1.8462

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		16.0496 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	44.5428 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	29.0444	28.6228	28.2011	26.0928	25.6712	23.5629	23.5629	23.1413	24.4062	25.6712	26.5145	27.3578	(38)
Heat transfer coeff													
	73.5872	73.1656	72.7439	70.6356	70.2140	68.1057	68.1057	67.6841	68.9490	70.2140	71.0573	71.9006	(39)
Average = Sum(39)m / 12 =												70.5302	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8090	0.8044	0.7997	0.7766	0.7719	0.7487	0.7487	0.7441	0.7580	0.7719	0.7812	0.7905	(40)
HLP (average)												0.7754	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.6386	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
68.4610	67.4321	65.9329	63.0644	60.9476	58.5869	57.2450	58.7329	60.3639	62.8986	65.8287	68.1987	(42a)

Hot water usage for baths

29.5637	29.1246	28.5063	27.3663	26.5127	25.5661	25.0549	25.6688	26.3373	27.3502	28.5137	29.4637	(42b)

Hot water usage for other uses

41.6522	40.1376	38.6230	37.1084	35.5937	34.0791	34.0791	35.5937	37.1084	38.6230	40.1376	41.6522	(42c)

Average daily hot water use (litres/day)	128.3946	(43)

Daily hot water use

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
139.6769	136.6944	133.0622	127.5391	123.0540	118.2321	116.3790	119.9955	123.8096	128.8717	134.4799	139.3147	(44)
Energy conte 221.2141	194.6510	204.5117	174.5947	165.6543	145.3802	140.7503	148.5795	152.6696	174.8777	191.5913	218.1331	(45)

Energy content (annual) Total = Sum(45)m =	2132.6075	
Distribution loss (46)m = 0.15 x (45)m		
33.1821 29.1976 30.6768 26.1892 24.8482 21.8070 21.1126 22.2869 22.9004 26.2317 28.7387 32.7200		(46)
Water storage loss:		
Store volume	210.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):	1.5800	(48)
Temperature factor from Table 2b	0.5400	(49)
Enter (49) or (54) in (55)	0.8532	(55)
Total storage loss		
26.4492 23.8896 26.4492 25.5960 26.4492 25.5960 26.4492 26.4492 25.5960 26.4492 25.5960 26.4492		(56)
If cylinder contains dedicated solar storage		
17.0031 15.3576 17.0031 16.4546 17.0031 16.4546 17.0031 17.0031 16.4546 17.0031 16.4546 17.0031		(57)
Primary loss 23.2624 21.0112 21.8667 15.7584 10.4681 9.9053 10.2355 11.1660 17.1091 21.8667 22.5120 23.2624		(59)
Combi loss 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000		(61)
Total heat required for water heating calculated for each month		
261.4795 231.0198 243.3814 206.8077 193.1255 171.7400 167.9889 176.7485 186.2333 213.7474 230.5579 258.3985		(62)
WWHRS 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000		(63a)
PV diverter -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000		(63b)
Aperture area of solar collector	3.0000	(H1)
Zero-loss collector efficiency	0.8000	(H2)
Collector linear heat loss coefficient	1.8000	(H3)
Collector 2nd order heat loss coefficient	0.0000	(H4)
Collector loop efficiency	0.9000	(H5)
Incidence angle modifier	1.0000	(H6)
Overshading factor	0.8000	(H8)
Overall heat loss coefficient of system	6.5000	(H10)
Heat loss coefficient of collector loop	3.9667	(H11)

Dedicated solar storage volume												75.0000	(H12)
If combined cylinder, total volume of cylinder												210.0000	(H13)
Effective solar volume												115.5000	(H14)
Reference volume												225.0000	(H15)
Storage tank correction coefficient												1.1814	(H16)
Heat delivered to hot water												654.6757	(H24)
Heat delivered to space heating												0.0000	(H29)
Solar input												654.6757	
Solar input	-0.0000	-20.1906	-62.4438	-83.8682	-107.6151	-99.0457	-98.2732	-86.8675	-61.6791	-33.2791	-1.4133	-0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	261.4795	210.8291	180.9377	122.9394	85.5104	72.6943	69.7156	89.8809	124.5542	180.4683	229.1446	258.3985	(64)
									Total per year (kWh/year) = Sum(64)m =			1886.5527	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month													
	105.7660	93.8165	99.0959	83.8231	77.0570	69.4268	68.5903	71.9379	77.6136	89.2426	94.8774	104.7416	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	35.2685	31.3252	25.4754	19.2865	14.4169	12.1713	13.1516	17.0949	22.9447	29.1336	34.0032	36.2488	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	359.4520	363.1820	353.7825	333.7722	308.5128	284.7725	268.9125	265.1825	274.5820	294.5923	319.8517	343.5920	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	(71)
Water heating gains (Table 5)													
	142.1587	139.6079	133.1934	116.4210	103.5712	96.4261	92.1913	96.6907	107.7967	119.9497	131.7741	140.7817	(72)
Total internal gains													
	643.1223	640.3582	618.6944	575.7228	532.7440	499.6131	480.4985	485.2112	511.5665	549.9188	591.8722	626.8656	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	4.9800	19.6403	0.3000	0.0000	0.7700	22.5938	(76)
West	3.5300	19.6403	0.3000	0.0000	0.7700	16.0153	(80)

Solar gains	38.6090	75.5274	124.3829	181.4051	222.3188	227.5828	216.6681	186.1147	144.6625	89.6197	48.1409	31.7502	(83)
Total gains	681.7313	715.8856	743.0774	757.1279	755.0628	727.1959	697.1666	671.3260	656.2290	639.5384	640.0131	658.6158	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	29.9068	30.0792	30.2535	31.1565	31.3436	32.3139	32.3139	32.5152	31.9186	31.3436	30.9716	30.6084	
alpha	2.9938	3.0053	3.0169	3.0771	3.0896	3.1543	3.1543	3.1677	3.1279	3.0896	3.0648	3.0406	
util living area													
	0.9157	0.8984	0.8640	0.7984	0.6982	0.5451	0.4122	0.4410	0.6258	0.8030	0.8876	0.9213	(86)
Living	19.3145	19.5061	19.8448	20.2926	20.6435	20.8871	20.9649	20.9562	20.8144	20.3863	19.8161	19.3108	
Non living	18.6981	18.8880	19.2203	19.6648	19.9931	20.2209	20.2792	20.2776	20.1566	19.7621	19.2087	18.7064	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.1378	19.5061	19.8448	20.2926	20.6435	20.8871	20.9649	20.9562	20.8144	20.3863	19.8161	19.5471	(87)
Th 2	20.2455	20.2495	20.2536	20.2737	20.2777	20.2980	20.2980	20.3020	20.2899	20.2777	20.2697	20.2616	(88)
util rest of house													
	0.9069	0.8878	0.8496	0.7766	0.6646	0.4966	0.3518	0.3807	0.5791	0.7779	0.8746	0.9131	(89)
MIT 2	19.4539	18.8880	19.2203	19.6648	19.9931	20.2209	20.2792	20.2776	20.1566	19.7621	19.2087	18.9240	(90)
Living area fraction										fLA = Living area / (4) =		0.3196	(91)
MIT	19.6725	19.0856	19.4199	19.8655	20.2010	20.4338	20.4983	20.4945	20.3668	19.9616	19.4028	19.1231	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6725	19.0856	19.4199	19.8655	20.2010	20.4338	20.4983	20.4945	20.3668	19.9616	19.4028	19.1231	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8995	0.8687	0.8313	0.7632	0.6608	0.5063	0.3694	0.3977	0.5844	0.7657	0.8566	0.8983	(94)
Useful gains	613.1837	621.9176	617.6904	577.8741	498.9600	368.1690	257.5291	267.0090	383.4943	489.7138	548.2439	591.6221	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1131.2183	1037.8938	939.8427	774.5522	596.8894	397.3137	265.4963	277.1319	432.0910	657.3130	874.2039	1072.9796	(97)
Space heating kWh													
	385.4178	279.5360	239.6813	141.6082	72.8594	0.0000	0.0000	0.0000	0.0000	124.6938	234.6911	358.1300	(98a)
Space heating requirement - total per year (kWh/year)												1836.6177	
Solar heating kWh													
	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	385.4178	279.5360	239.6813	141.6082	72.8594	0.0000	0.0000	0.0000	0.0000	124.6938	234.6911	358.1300	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1836.6177	
Space heating per m2											(98c) / (4) =	20.1915	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												270.7081	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	385.4178	279.5360	239.6813	141.6082	72.8594	0.0000	0.0000	0.0000	0.0000	124.6938	234.6911	358.1300	(98)
Space heating efficiency (main heating system 1)													
	270.7081	270.7081	270.7081	270.7081	270.7081	0.0000	0.0000	0.0000	0.0000	270.7081	270.7081	270.7081	(210)
Space heating fuel (main heating system)													
	142.3739	103.2610	88.5386	52.3103	26.9144	0.0000	0.0000	0.0000	0.0000	46.0621	86.6953	132.2938	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	261.4795	210.8291	180.9377	122.9394	85.5104	72.6943	69.7156	89.8809	124.5542	180.4683	229.1446	258.3985	(64)
Efficiency of water heater												281.1060	(216)
(217)m	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	(217)
Fuel for water heating, kWh/month													
	93.0181	74.9999	64.3663	43.7342	30.4193	25.8601	24.8005	31.9740	44.3086	64.1994	81.5154	91.9221	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	36.4509	32.9233	36.4509	35.2750	36.4509	35.2750	36.4509	36.4509	35.2750	36.4509	35.2750	36.4509	(231)
Lighting	30.8703	24.7653	22.2984	16.3368	12.6190	10.3098	11.5115	14.9631	19.4355	25.5005	28.8027	31.7283	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-37.4126	-55.2815	-82.5768	-94.8457	-102.3112	-93.2996	-92.1870	-86.5589	-76.2048	-63.7088	-41.7331	-31.9441	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-12.6739	-28.2985	-59.7695	-95.9263	-133.3716	-138.4141	-136.4645	-113.2151	-80.2583	-43.1370	-17.6767	-9.9697	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	678.4495	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	281.1060	
Water heating fuel used	671.1179	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.1900)		
mechanical ventilation fans (SFP = 1.1900)	349.1794	(230a)
pump for solar water heating	80.0000	(230g)
Total electricity for the above, kWh/year	429.1794	(231)
Electricity for lighting (calculated in Appendix L)	249.1413	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1727.2394	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	300.6487	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	678.4495	16.4900	111.8763	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	671.1179	16.4900	110.6673	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	349.1794	16.4900	57.5797	(249)
Pump for solar water heating	80.0000	16.4900	13.1920	(249)
Energy for lighting	249.1413	16.4900	41.0834	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-858.0643	16.4900	-141.4948	
PV Unit electricity exported	-869.1751	5.5900	-48.5869	
Total			-190.0817	(252)
Total energy cost			144.3171	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.3821	(257)
SAP value		93.8057	
SAP rating (Section 12)		94	(258)
SAP band		A	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	678.4495	0.1551	105.2275	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	671.1179	0.1462	98.1454	(264)
Space and water heating			203.3729	(265)
Pumps, fans and electric keep-hot	429.1794	0.1387	59.5325	(267)
Energy for lighting	249.1413	0.1443	35.9588	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-858.0643	0.1343	-115.2389	
PV Unit electricity exported	-869.1751	0.1239	-107.6905	
Total			-222.9293	(269)
Total CO2, kg/year			75.9348	(272)
CO2 emissions per m2			0.8300	(273)
EI value			99.2516	
EI rating			99	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	41.1800	(1b) x	2.4800	(2b) =	102.1264	(1b) - (3b)
First floor	49.7800	(1c) x	2.7800	(2c) =	138.3884	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	90.9600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		240.5148	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.2500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2125	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.6000	4.5000	4.5000	4.1000	4.2000	3.7000	3.5000	3.5000	3.7000	4.1000	4.1000	4.2000	(22)
Wind factor	1.1500	1.1250	1.1250	1.0250	1.0500	0.9250	0.8750	0.8750	0.9250	1.0250	1.0250	1.0500	(22a)
Adj infilt rate	0.2444	0.2391	0.2391	0.2178	0.2231	0.1966	0.1859	0.1859	0.1966	0.2178	0.2178	0.2231	(22b)
Balanced mechanical ventilation with heat recovery													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												81.0000	(23c)
Effective ac	0.3394	0.3341	0.3341	0.3128	0.3181	0.2916	0.2809	0.2809	0.2916	0.3128	0.3128	0.3181	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door			4.1400	1.0000	4.1400			(26)
Window			8.5100	0.7752	6.5969			(27)
GF			41.1800	0.0800	3.2944	75.0000	3088.5000	(28a)
Exposed Floor			8.6000	0.1400	1.2040	20.0000	172.0000	(28b)
Main	64.8536	12.6500	52.2036	0.1300	6.7865	9.0000	469.8324	(29a)
PIJ	49.7800		49.7800	0.1300	6.4714	9.0000	448.0200	(30)
Total net area of external elements Aum(A, m2)			164.4136					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		28.4932			(33)
Main dwelling								
Party Wall 1			88.2100	0.0000	0.0000	20.0000	1764.2000	(32)
Timber			96.4800			9.0000	868.3200	(32c)
FF			41.1800			18.0000	741.2400	(32d)
GF			41.1800			9.0000	370.6200	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		7922.7324	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							87.1013	(35)
List of Thermal Bridges								
K1 Element				Length	Psi-value	Total		

E2 Other lintels (including other steel lintels)	8.6300	0.1150	0.9925	
E3 Sill	8.6300	0.0170	0.1467	
E4 Jamb	28.2000	0.0940	2.6508	
E5 Ground floor (normal)	13.8200	0.0670	0.9259	
E16 Corner (normal)	4.9600	0.0680	0.3373	
E12 Gable (insulation at ceiling level)	11.0000	0.0770	0.8470	
E6 Intermediate floor within a dwelling	11.0000	0.0320	0.3520	
E17 Corner (inverted - internal area greater than external area)	4.9600	-0.0290	-0.1438	
P1 Party wall - Ground floor	15.2800	0.3200	4.8896	
E20 Exposed floor (normal)	6.4400	0.0790	0.5088	
E21 Exposed floor (inverted)	12.0800	0.0630	0.7610	
E18 Party wall between dwellings	21.0400	0.0920	1.9357	
P4 Party wall - Roof (insulation at ceiling level)	18.1000	0.1020	1.8462	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 16.0496 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 44.5428 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	26.9362	26.5145	26.5145	24.8279	25.2495	23.1413	22.2980	22.2980	23.1413	24.8279	24.8279	25.2495	(38)
Heat transfer coeff	71.4789	71.0573	71.0573	69.3707	69.7923	67.6841	66.8408	66.8408	67.6841	69.3707	69.3707	69.7923	(39)

Average = Sum(39)m / 12 = 69.1950

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7858	0.7812	0.7812	0.7627	0.7673	0.7441	0.7348	0.7348	0.7441	0.7627	0.7627	0.7673	(40)
HLP (average)												0.7607	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6386 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
68.4610	67.4321	65.9329	63.0644	60.9476	58.5869	57.2450	58.7329	60.3639	62.8986	65.8287	68.1987	(42a)

Hot water usage for baths

29.5637	29.1246	28.5063	27.3663	26.5127	25.5661	25.0549	25.6688	26.3373	27.3502	28.5137	29.4637	(42b)

Hot water usage for other uses

41.6522	40.1376	38.6230	37.1084	35.5937	34.0791	34.0791	35.5937	37.1084	38.6230	40.1376	41.6522	(42c)

Average daily hot water use (litres/day) 128.3946 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	139.6769	136.6944	133.0622	127.5391	123.0540	118.2321	116.3790	119.9955	123.8096	128.8717	134.4799	139.3147	(44)
Energy conte	221.2141	194.6510	204.5117	174.5947	165.6543	145.3802	140.7503	148.5795	152.6696	174.8777	191.5913	218.1331	(45)
Energy content (annual)										Total = Sum(45)m =		2132.6075	
Distribution loss (46)m = 0.15 x (45)m	33.1821	29.1976	30.6768	26.1892	24.8482	21.8070	21.1126	22.2869	22.9004	26.2317	28.7387	32.7200	(46)

Water storage loss:
Store volume 210.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.5800 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.8532 (55)
Total storage loss

26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(56)

If cylinder contains dedicated solar storage

17.0031	15.3576	17.0031	16.4546	17.0031	16.4546	17.0031	17.0031	16.4546	17.0031	16.4546	17.0031	(57)
Primary loss 23.2624	21.0112	21.8667	15.7584	10.4681	9.9053	10.2355	11.1660	17.1091	21.8667	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

261.4795	231.0198	243.3814	206.8077	193.1255	171.7400	167.9889	176.7485	186.2333	213.7474	230.5579	258.3985	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)

Aperture area of solar collector 3.0000 (H1)
Zero-loss collector efficiency 0.8000 (H2)
Collector linear heat loss coefficient 1.8000 (H3)
Collector 2nd order heat loss coefficient 0.0000 (H4)
Collector loop efficiency 0.9000 (H5)
Incidence angle modifier 1.0000 (H6)
Overshading factor 0.8000 (H8)
Overall heat loss coefficient of system 6.5000 (H10)
Heat loss coefficient of collector loop 3.9667 (H11)
Dedicated solar storage volume 75.0000 (H12)
If combined cylinder, total volume of cylinder 210.0000 (H13)
Effective solar volume 115.5000 (H14)
Reference volume 225.0000 (H15)
Storage tank correction coefficient 1.1814 (H16)
Heat delivered to hot water 599.1897 (H24)
Heat delivered to space heating 0.0000 (H29)
Solar input 599.1897

Solar input -0.0000	-14.4822	-56.8249	-79.3403	-100.2904	-94.0949	-90.8995	-78.3168	-56.9604	-27.9802	-0.0000	-0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

261.4795	216.5376	186.5565	127.4673	92.8350	77.6451	77.0894	98.4317	129.2728	185.7672	230.5579	258.3985	(64)
							Total per year (kWh/year) = Sum(64)m =				1942.0387	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
							Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =				0.0000	(64a)

Heat gains from water heating, kWh/month

105.7660	93.8165	99.0959	83.8231	77.0570	69.4268	68.5903	71.9379	77.6136	89.2426	94.8774	104.7416	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	35.2685	31.3252	25.4754	19.2865	14.4169	12.1713	13.1516	17.0949	22.9447	29.1336	34.0032	36.2488	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	359.4520	363.1820	353.7825	333.7722	308.5128	284.7725	268.9125	265.1825	274.5820	294.5923	319.8517	343.5920	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)	
Losses e.g. evaporation (negative values) (Table 5)	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	(71)
Water heating gains (Table 5)													

	142.1587	139.6079	133.1934	116.4210	103.5712	96.4261	92.1913	96.6907	107.7967	119.9497	131.7741	140.7817	(72)
Total internal gains	643.1223	640.3582	618.6944	575.7228	532.7440	499.6131	480.4985	485.2112	511.5665	549.9188	591.8722	626.8656	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	4.9800	16.6187	0.3000	0.0000	0.7700	19.1178	(76)
West	3.5300	16.6187	0.3000	0.0000	0.7700	13.5514	(80)

Solar gains	32.6692	67.1355	116.6090	172.9395	207.2659	216.2037	201.7650	170.7039	137.1149	82.8303	42.3057	28.7264	(83)
Total gains	675.7915	707.4937	735.3035	748.6623	740.0099	715.8167	682.2635	655.9152	648.6814	632.7491	634.1778	655.5920	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	30.7889	30.9716	30.9716	31.7246	31.5330	32.5152	32.9254	32.9254	32.5152	31.7246	31.7246	31.5330	
alpha	3.0526	3.0648	3.0648	3.1150	3.1022	3.1677	3.1950	3.1950	3.1677	3.1150	3.1150	3.1022	
util living area	0.9105	0.8925	0.8598	0.7866	0.6771	0.5223	0.4139	0.4372	0.6245	0.7975	0.8800	0.9156	(86)
Living	19.4520	19.6341	19.9169	20.3665	20.6987	20.9076	20.9663	20.9596	20.8224	20.4227	19.9237	19.4549	
Non living	18.8477	19.0280	19.3024	19.7444	20.0463	20.2410	20.2920	20.2879	20.1742	19.8028	19.3253	18.8626	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.2081	19.6341	19.9169	20.3665	20.6987	20.9076	20.9663	20.9596	20.8224	20.4227	19.9237	19.6710	(87)
Th 2	20.2656	20.2697	20.2697	20.2858	20.2818	20.3020	20.3102	20.3102	20.3020	20.2858	20.2858	20.2818	(88)
util rest of house	0.9012	0.8814	0.8451	0.7637	0.6407	0.4716	0.3542	0.3765	0.5784	0.7716	0.8661	0.9068	(89)
MIT 2	19.5403	19.0280	19.3024	19.7444	20.0463	20.2410	20.2920	20.2879	20.1742	19.8028	19.3253	19.0611	(90)
Living area fraction										fLA = Living area / (4) =		0.3196	(91)
MIT	19.7537	19.2217	19.4988	19.9432	20.2548	20.4541	20.5075	20.5026	20.3813	20.0009	19.5165	19.2560	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7537	19.2217	19.4988	19.9432	20.2548	20.4541	20.5075	20.5026	20.3813	20.0009	19.5165	19.2560	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8940	0.8630	0.8275	0.7517	0.6393	0.4830	0.3716	0.3938	0.5839	0.7603	0.8489	0.8923	(94)
Useful gains	604.1499	610.5443	608.4308	562.7679	473.0604	345.7264	253.5441	258.2962	378.7460	481.0579	538.3296	584.9821	(95)
Ext temp.	4.7000	5.3000	6.7000	9.3000	12.3000	15.0000	16.6000	16.5000	14.1000	10.8000	7.5000	4.6000	(96)
Heat loss rate W	1076.0231	989.2387	909.4455	738.3266	555.1862	369.1525	261.1787	267.5356	425.1462	638.2757	833.5944	1022.8793	(97)
Space heating kWh	351.0737	254.4826	223.9550	126.4022	61.1016	0.0000	0.0000	0.0000	0.0000	116.9700	212.5906	325.7955	(98a)
Space heating requirement - total per year (kWh/year)												1672.3713	
Solar heating kWh	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	351.0737	254.4826	223.9550	126.4022	61.1016	0.0000	0.0000	0.0000	0.0000	116.9700	212.5906	325.7955	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1672.3713	
Space heating per m2											(98c) / (4) =	18.3858	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												269.7489	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	351.0737	254.4826	223.9550	126.4022	61.1016	0.0000	0.0000	0.0000	0.0000	116.9700	212.5906	325.7955	(98)
Space heating efficiency (main heating system 1)	269.7489	269.7489	269.7489	269.7489	269.7489	0.0000	0.0000	0.0000	0.0000	269.7489	269.7489	269.7489	(210)
Space heating fuel (main heating system)	130.1483	94.3406	83.0235	46.8592	22.6513	0.0000	0.0000	0.0000	0.0000	43.3626	78.8106	120.7773	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	261.4795	216.5376	186.5565	127.4673	92.8350	77.6451	77.0894	98.4317	129.2728	185.7672	230.5579	258.3985	(64)
Efficiency of water heater												281.4160	(216)
(217)m	281.4160	281.4160	281.4160	281.4160	281.4160	281.4160	281.4160	281.4160	281.4160	281.4160	281.4160	281.4160	(217)
Fuel for water heating, kWh/month	92.9156	76.9457	66.2921	45.2950	32.9885	27.5909	27.3934	34.9773	45.9366	66.0116	81.9278	91.8208	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	36.4509	32.9233	36.4509	35.2750	36.4509	35.2750	36.4509	36.4509	35.2750	36.4509	35.2750	36.4509	(231)
Lighting	30.8703	24.7653	22.2984	16.3368	12.6190	10.3098	11.5115	14.9631	19.4355	25.5005	28.8027	31.7283	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-32.3272	-50.1980	-78.6403	-91.6477	-98.0326	-90.9865	-89.0327	-82.6495	-73.7822	-60.0630	-37.4118	-29.2154	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)

Electricity generated by PVs (Appendix M) (negative quantity)

(233b)m	-10.0537	-24.0953	-54.8093	-90.2216	-121.6925	-129.1415	-123.8914	-100.5827	-74.5176	-38.6885	-14.7968	-8.7066	(233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	619.9733	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	281.4160	
Water heating fuel used	690.0953	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.1900)		
mechanical ventilation fans (SFP = 1.1900)	349.1794	(230a)
pump for solar water heating	80.0000	(230g)
Total electricity for the above, kWh/year	429.1794	(231)
Electricity for lighting (calculated in Appendix L)	249.1413	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1605.1846	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	383.2047	(238)

10a. Fuel costs - using BEDF prices (583)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	619.9733	28.4300	176.2584	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	690.0953	28.4300	196.1941	(247)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(247a)
Pumps, fans and electric keep-hot	349.1794	28.4300	99.2717	(249)
Pump for solar water heating	80.0000	28.4300	22.7440	(249)
Energy for lighting	249.1413	28.4300	70.8309	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-813.9870	28.4300	-231.4165	
PV Unit electricity exported	-791.1976	5.8100	-45.9686	
Total			-277.3851	(252)
Total energy cost			287.9140	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	619.9733	0.1551	96.1865	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	690.0953	0.1458	100.6197	(264)
Space and water heating			196.8062	(265)
Pumps, fans and electric keep-hot	429.1794	0.1387	59.5325	(267)
Energy for lighting	249.1413	0.1443	35.9588	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-813.9870	0.1339	-109.0180	
PV Unit electricity exported	-791.1976	0.1237	-97.8355	
Total			-206.8535	(269)
Total CO2, kg/year			85.4440	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	619.9733	1.5744	976.0710	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	690.0953	1.5394	1062.3003	(278)
Space and water heating			2038.3713	(279)
Pumps, fans and electric keep-hot	429.1794	1.5128	649.2626	(281)
Energy for lighting	249.1413	1.5338	382.1413	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-813.9870	1.4950	-1216.8829	
PV Unit electricity exported	-791.1976	0.4538	-359.0721	
Total			-1575.9549	(283)
Total Primary energy kWh/year			1493.8202	(286)

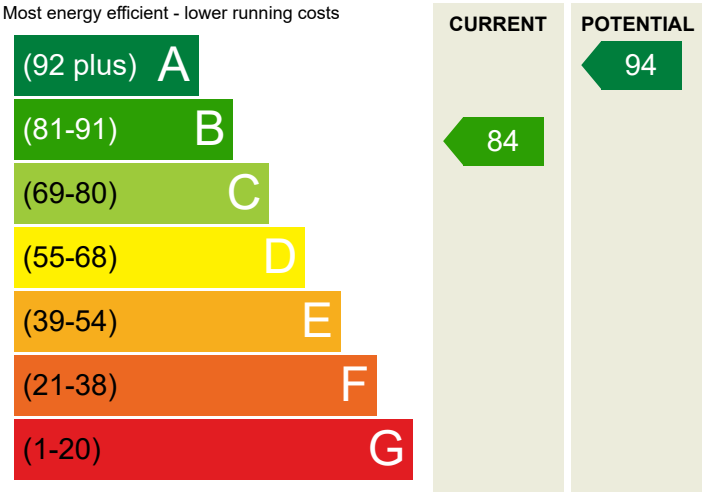
Energy Report

Dwelling Address	826 Rochdale Road, MANCHESTER, M9 8FA
Reference	78449-15-001
Assessment Date	02/07/2025
Submission Date	
Property Type	House, Mid-Terrace
Total Floor Area	91

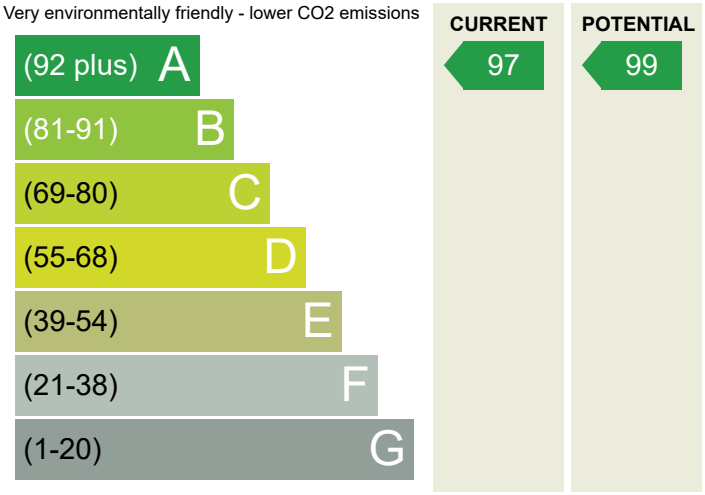
This Energy Report has been generated using the UK's National Calculation Methodology for dwellings, Standard Assessment Procedure (SAP). This methodology is used to assess the energy efficiency of dwellings which is calculated based on a dwelling's heating, hot water, ventilation and lighting usage.

This document is not an Energy Performance Certificate (EPC) as required by the Energy Performance of Buildings Regulations

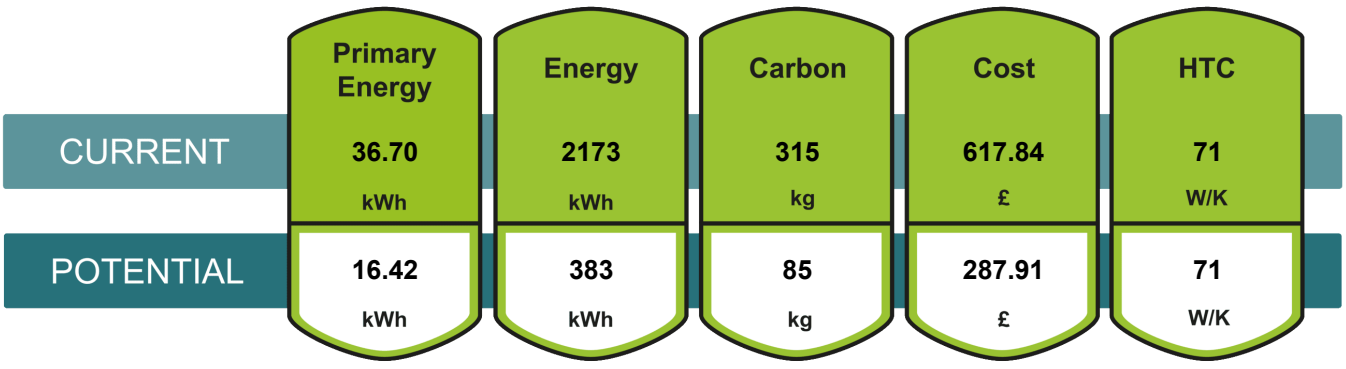
Energy Efficiency Rating



Carbon Dioxide (CO2) Emissions Rating



Additional ratings for your home



Energy Report

Breakdown of property's energy performance

Each feature is assessed as one of the following:

Very Poor | Poor | Average | Good | Very Good

Feature	Description	Energy Performance
Walls	Average thermal transmittance 0.13 W/m²K	Very Good
Roof	Average thermal transmittance 0.13 W/m²K	Very Good
Floor	Average thermal transmittance 0.09 W/m²K	Very Good
Windows	High performance glazing	Very Good
Main heating	Air source heat pump, radiators, electric	Good
Main heating controls	Programmer, room thermostat and TRVs	Good
Secondary heating	None	
Hot water	From main system	Good
Lighting	Good lighting efficiency	Good
Air tightness	Air permeability [AP50] = 5.0 m³/h.m² (as tested)	Good

Recommendations

The recommended measures provided below will help to improve the energy efficiency of the dwelling.
To reach the dwelling's potential energy rating all of the recommended measures shown below would need to be installed.
Having these measures installed individually or in any other order may give a different result when compared with the cumulative potential rating.

Recommended measures	Cumulative savings (per year)	Cumulative rating	Typical costs	Incremental savings (per year)	Cumulative CO2 rating
Solar water heating	£53	B 86	£4,000 - £7,000	£53	A 97
Photovoltaic	£330	A 94	£8,000 - £10,000	£277	A 99

Energy Report

The typical cost is based on average installation prices across the country so may not be representative of the actual costs in your area.

Estimated energy costs of the dwelling

The table below shows the estimated running costs of the space and water heating and lighting within the dwelling. It does not include the energy used from household appliances. The estimated annual costs after potential improvements indicates the total energy cost if all recommended measures named above were installed.

	Estimated annual costs	Estimated annual costs after potential improvements	Potential future savings
Lighting	£71	£71	
Heating	£272	£298	
Hot Water	£275	£196	
New Technologies e.g. Impact of PV	£0	-(£277)	
TOTAL	£618	£288	

Estimated energy use and potential savings

Space Heating
609
kWh per year

Water Heating
966
kWh per year

Energy Report

About this document

Created by:	
Company/Trading name:	
Phone number:	
Email address:	

Disclaimer

This Energy Report should not under any circumstances be treated as a Condition Survey and cannot be used to indicate that any element of the dwelling (e.g.heating system) is working correctly.
This Energy Report must not be used in situations where an Energy Performance Certificate (EPC) is required.
This Energy Report is generated from a set of data inputs which may not reflect the actual dimensions, services or construction of the dwelling.
The calculation used to generate this report reflects the SAP Methodology current at the time of report generation.

Glossary terms for additional metrics

Primary Energy	The measure of the energy required for lighting, heating and hot water in a property. This includes the efficiency of the property's heating system, power station efficiency for electricity and the energy used to produce the fuel and deliver it to the property.
Energy Used	The estimated amount of fuel energy for lighting, heating and hot water for the property. The estimate is based on typical usage which is likely to be different to actual consumption.
Carbon (CO2)	The current emissions based on the energy estimates.
Cost	The estimated cost of energy. The cost of each unit of fuel is based on an industry standard which is likely to be different to those the occupier actually pays.
Heat Transfer Coefficient	Heat flow through the property envelope where internal and external temperatures are different.

Building Regulations England Part L (BREL) Compliance Report

Approved Document L1 2021 Edition, England assessed by Array SAP 10 program, Array

Date: Fri 03 Oct 2025 15:03:29

Project Information			
Assessed By	Paul Goddard	Building Type	House, Mid-terrace
OCDEA Registration	EES/005113	Assessment Date	2025-10-03

Dwelling Details			
Assessment Type	As built	Total Floor Area	114 m^2
Site Reference	78449-16	Plot Reference	001
Address	824 Rochdale Road, MANCHESTER, M9 8FA		

Client Details	
Name	-
Company	John Southworth
Address	Unit 10, Charles Street, DUKINFIELD, SK16 4SD

This report covers items included within the SAP calculations. It is not a complete report of regulations compliance.

1a Target emission rate and dwelling emission rate		
Fuel for main heating system	Electricity	
Target carbon dioxide emission rate	*10.89 $kgCO_2/m^2$*	
Dwelling carbon dioxide emission rate	3.35 $kgCO_2/m^2$	OK
1b Target primary energy rate and dwelling primary energy		
Target primary energy	*57.23 kWh_{PE}/m^2*	
Dwelling primary energy	35.46 kWh_{PE}/m^2	OK
1c Target fabric energy efficiency and dwelling fabric energy efficiency		
Target fabric energy efficiency	*36.9 kWh/m^2*	
Dwelling fabric energy efficiency	32.6 kWh/m^2	OK

2a Fabric U-values				
Element	***Maximum permitted average U-Value [W/m^2K]***	**Dwelling average U-Value [W/m^2K]**	**Element with highest individual U-Value**	
External walls	*0.26*	0.12	Walls (1) (0.13)	OK
Party walls	*0.2*	0	Party Wall (1) (0)	**N/A**
Curtain walls	*1.6*	0	N/A	**N/A**
Floors	*0.18*	0.1	Exposed Floor (0.14)	OK
Roofs	*0.16*	0.11	Roof (1) (0.13)	OK
Windows, doors, and roof windows	*1.6*	0.87	Front (1)	OK
Rooflights	*2.2*	N/A	N/A	**N/A**

2b Envelope elements (better than typically expected values are flagged with a subsequent (!))		
Name	**Net area [m^2]**	**U-Value [W/m^2K]**
Exposed wall: Walls (1)	75.85	0.13 **(!)**
Exposed wall: Walls (2)	16.77	0.09 **(!)**
Party wall: Party Wall (1)	88.21	0 **(!)**
Ground floor: GF, GF	41.18	0.09 **(!)**
Upper floor: Exposed Floor, Exposed Floor	8.6	0.14
Exposed roof: Roof (1)	15.51	0.13
Exposed roof: Roof (2)	12.23	0.13
Exposed roof: Roof (3)	26.38	0.09 **(!)**

2c Openings (better than typically expected values are flagged with a subsequent (!))				
Name	**Area [m^2]**	**Orientation**	**Frame factor**	**U-Value [W/m^2K]**
Front, Door	1.99	East	N/A	1 **(!)**
Front, Window	4.98	East	1.0	0.8 **(!)**
Rear, Window	3.53	West	1.0	0.8 **(!)**
Rear, Door	2.15	West	N/A	1 **(!)**

2d Thermal bridging (better than typically expected values are flagged with a subsequent (!))
Building part **1**: Thermal bridging calculated from linear thermal transmittances for each junction

Main element	Junction detail	Source	Psi value [W/mK]	Drawing / reference
External wall	E2: Other lintels (including other steel lintels)	Calculated by person with suitable expertise	0.115	Thermal Bridge Report
External wall	E3: Sill	Calculated by person with suitable expertise	0.017 **(!)**	Thermal Bridge Report
External wall	E4: Jamb	Calculated by person with suitable expertise	0.094	Thermal Bridge Report
External wall	E5: Ground floor (normal)	Calculated by person with suitable expertise	0.067	Thermal Bridge Report
External wall	E11: Eaves (insulation at rafter level)	Calculated by person with suitable expertise	0.025 **(!)**	Thermal Bridge Report
External wall	E16: Corner (normal)	Calculated by person with suitable expertise	0.068	Thermal Bridge Report
External wall	E12: Gable (insulation at ceiling level)	Calculated by person with suitable expertise	0.077	Thermal Bridge Report
External wall	E6: Intermediate floor within a dwelling	Calculated by person with suitable expertise	0.032 **(!)**	Thermal Bridge Report
External wall	E17: Corner (inverted - internal area greater than external area)	Calculated by person with suitable expertise	-0.029 **(!)**	Thermal Bridge Report
Party wall	P1: Ground floor	SAP table default	0.32	K1
External wall	E20: Exposed floor (normal)	Calculated by person with suitable expertise	0.079	Thermal Bridge Report
External wall	E21: Exposed floor (inverted)	Calculated by person with suitable expertise	0.063	Thermal Bridge Report
External wall	E13: Gable (insulation at rafter level)	Calculated by person with suitable expertise	0.074	Thermal Bridge Report
External wall	E18: Party wall between dwellings	Calculated by person with suitable expertise	0.092	Thermal Bridge Report
Roof	R6: Flat ceiling	Calculated by person with suitable expertise	-0.043	Thermal Bridge Report
External wall	E25: Staggered party wall between dwellings	Calculated by person with suitable expertise	0.056	Thermal Bridge Report

3 Air permeability (better than typically expected values are flagged with a subsequent (!))		
Maximum permitted air permeability at 50Pa	*8 m^3/hm^2*	
Dwelling air permeability at 50Pa	5 m^3/hm^2, Measured value	OK
Air permeability test certificate reference		

4 Space heating	
Main heating system 1: Heat pump with radiators or underfloor heating - Electricity	
Efficiency	277.7%
Emitter type	Radiators
Flow temperature	45°C
System type	
Manufacturer	Daikin Europe NV
Model	EDLA09DA3V3
Commissioning	
Secondary heating system: N/A	
Fuel	N/A
Efficiency	N/A
Commissioning	

5 Hot water	
Cylinder/store - type: Cylinder	
Capacity	210 litres
Declared heat loss	1.58 kWh/day
Primary pipework insulated	Yes
Manufacturer	
Model	
Commissioning	
Waste water heat recovery system 1 - type: N/A	
Efficiency	
Manufacturer	
Model	

6 Controls		
Main heating 1 - type: Programmer, room thermostat and TRVs		
Function		
Ecodesign class		
Manufacturer		
Model		
Water heating - type: Cylinder thermostat and HW separately timed		
Manufacturer		
Model		

7 Lighting		
Minimum permitted light source efficacy	*75 lm/W*	
Lowest light source efficacy	80 lm/W	OK
External lights control	N/A	

8 Mechanical ventilation		
System type: Balanced whole-house mechanical ventilation with heat recovery		
Maximum permitted specific fan power	*1.5 W/(l/s)*	
Specific fan power	0.97 W/(l/s)	OK
Minimum permitted heat recovery efficiency	*73%*	
Heat recovery efficiency	89%	OK
Manufacturer/Model	DV110 Adroit	
Commissioning		

9 Local generation
N/A

10 Heat networks
N/A

11 Supporting documentary evidence	
Documentary evidence identified in 11.1 and 11.2 is needed to confirm the data values used for any calculations undertaken, manufacturer declarations made, and tests performed as reflected in this "As built" BREL Compliance Report are correct. 11.1 SAP Conventions, Appendix 1 (documentary evidence) schedules the minimum documentary evidence required. 11.2 Indicative photographic evidence of key stages during construction (guidance within Approved Document L, Volume 1 – Appendix B) that confirms the products identified in this BREL Compliance Report are used in this dwelling, and workmanship is of sufficient quality to support the calculated values claimed in 2a to 2d.	

12 Declarations	
a. Assessor Declaration	
This declaration by the assessor is confirmation that the contents of this BREL Compliance Report are a true and accurate reflection based upon the design and construction information submitted for this dwelling for the purpose of carrying out the assessment, and that the supporting documentary evidence (identified in 11.1 and 11.2) pursuant to Part L of the Building Regulations 2010 (as amended) has been reviewed in the course of preparing this BREL Compliance Report.	
Signed: Name:	Assessor ID: Date:
b. Client Declaration	
This declaration by the client is confirmation that the dwelling has been constructed and completed according to the specifications set out in this BREL Compliance Report, and that photographic evidence of key stages, as described in 11.2, has been provided to the Assessor for this dwelling.	
Signed: Name:	Organisation: Date:

Full SAP Calculation Printout

Property Reference	78449-16	**Issued on Date**	03/10/2025
Assessment Reference	001	**Prop Type Ref**	Mid
Property	824 Rochdale Road, MANCHESTER, M9 8FA		

SAP Rating	84 B	**DER**	3.35	**TER**	10.89
Environmental	97 A	**% DER < TER**			69.24
CO_2 Emissions (t/year)	0.37	**DFEE**	32.64	**TFEE**	36.91
Compliance Check	See BREL	**% DFEE < TFEE**			11.56
% DPER < TPER	38.04	**DPER**	35.46	**TPER**	57.23

Assessor Details	Mr. Daniel Goddard	**Assessor ID**	CP52-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	41.1800 (1b)	x	2.4800 (2b)	=	102.1264	(1b) - (3b)
First floor	49.7800 (1c)	x	2.7800 (2c)	=	138.3884	(1c) - (3c)
Second floor	23.4000 (1d)	x	2.7700 (2d)	=	64.8180	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	114.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	305.3328	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.2500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2125	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2709	0.2656	0.2603	0.2338	0.2284	0.2019	0.2019	0.1966	0.2125	0.2284	0.2391	0.2497	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	80.1000 (23c)

Effective ac	0.3704	0.3651	0.3598	0.3332	0.3279	0.3014	0.3014	0.2961	0.3120	0.3279	0.3386	0.3492	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door			4.1400	1.0000	4.1400			(26)
Window			8.5100	0.7752	6.5969			(27)
GF			41.1800	0.0900	3.7062	75.0000	3088.5000	(28a)
Exposed Floor			8.6000	0.1400	1.2040	20.0000	172.0000	(28b)
Main	88.5000	12.6500	75.8500	0.1300	9.8605	9.0000	682.6500	(29a)
Dwarf Wall (PIRx0.72)	16.7700		16.7700	0.0900	1.5093	9.0000	150.9300	(29a)
PIJ	15.5100		15.5100	0.1300	2.0163	9.0000	139.5900	(30)
PIR	12.2300		12.2300	0.1300	1.5899	9.0000	110.0700	(30)
Residual Ceiling	26.3800		26.3800	0.0900	2.3742	9.0000	237.4200	(30)
Total net area of external elements Aum(A, m2)			209.1700					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		32.9973			(33)
Main dwelling								
Party Wall 1			88.2100	0.0000	0.0000	20.0000	1764.2000	(32)

Timber	124.1700		9.0000	1117.5300 (32c)
FF	41.1800		18.0000	741.2400 (32d)
SF	23.4000		18.0000	421.2000 (32d)
GF	41.1800		9.0000	370.6200 (32e)
FF	23.4000		9.0000	210.6000 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 9206.5500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 80.5050 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	8.6300	0.1150	0.9925
E3 Sill	8.6300	0.0170	0.1467
E4 Jamb	28.2000	0.0940	2.6508
E5 Ground floor (normal)	13.8200	0.0670	0.9259
E11 Eaves (insulation at rafter level)	18.1000	0.0250	0.4525
E16 Corner (normal)	16.0400	0.0680	1.0907
E12 Gable (insulation at ceiling level)	5.6600	0.0770	0.4358
E6 Intermediate floor within a dwelling	30.5000	0.0320	0.9760
E17 Corner (inverted - internal area greater than external area)	2.4800	-0.0290	-0.0719
P1 Party wall - Ground floor	15.2800	0.3200	4.8896
E20 Exposed floor (normal)	6.4400	0.0790	0.5088
E21 Exposed floor (inverted)	12.0800	0.0630	0.7610
E13 Gable (insulation at rafter level)	8.2800	0.0740	0.6127
E18 Party wall between dwellings	16.0800	0.0920	1.4794
R6 Flat ceiling	18.1000	-0.0430	-0.7783
E25 Staggered party wall between dwellings	4.9600	0.0560	0.2778

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 15.3500 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 48.3473 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	37.3252	36.7899	36.2546	33.5782	33.0429	30.3665	30.3665	29.8312	31.4371	33.0429	34.1135	35.1841	(38)
Heat transfer coeff	85.6725	85.1372	84.6019	81.9255	81.3902	78.7138	78.7138	78.1785	79.7843	81.3902	82.4608	83.5313	(39)
Average = Sum(39)m / 12 =												81.7916	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7491	0.7445	0.7398	0.7164	0.7117	0.6883	0.6883	0.6836	0.6977	0.7117	0.7211	0.7304	(40)
HLP (average)												0.7152	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.8386 (42)
Hot water usage for mixer showers

71.8141	70.7349	69.1622	66.1532	63.9327	61.4564	60.0488	61.6096	63.3204	65.9793	69.0529	71.5389	(42a)

Hot water usage for baths

31.0056	30.5451	29.8967	28.7011	27.8058	26.8131	26.2769	26.9208	27.6219	28.6841	29.9044	30.9008	(42b)

Hot water usage for other uses

43.7003	42.1112	40.5221	38.9330	37.3439	35.7548	35.7548	37.3439	38.9330	40.5221	42.1112	43.7003	(42c)

Average daily hot water use (litres/day) 134.6848 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	146.5200	143.3912	139.5810	133.7873	129.0824	124.0242	122.0805	125.8742	129.8753	135.1855	141.0684	146.1400	(44)
Energy conte	232.0518	204.1871	214.5308	183.1481	173.7697	152.5023	147.6458	155.8586	160.1492	183.4454	200.9778	228.8199	(45)
Energy content (annual)										Total = Sum(45)m =		2237.0865	
Distribution loss (46)m = 0.15 x (45)m	34.8078	30.6281	32.1796	27.4722	26.0655	22.8753	22.1469	23.3788	24.0224	27.5168	30.1467	34.3230	(46)
Water storage loss:													
Store volume												210.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5800	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8532	(55)
Total storage loss	26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(56)
If cylinder contains dedicated solar storage	26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	281.7634	249.0879	264.2424	231.2561	223.4813	200.6103	197.3574	205.5702	208.2572	233.1570	249.0858	278.5315	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	281.7634	249.0879	264.2424	231.2561	223.4813	200.6103	197.3574	205.5702	208.2572	233.1570	249.0858	278.5315	(64)
										Total per year (kWh/year) = Sum(64)m =		2822.4005	(64)
12Total per year (kWh/year)												2822	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	116.9265	103.8129	111.1008	99.3831	97.5477	89.1934	88.8615	91.5923	91.7360	100.7649	105.3115	115.8519	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	141.9308	141.9308	141.9308	141.9308	141.9308	141.9308	141.9308	141.9308	141.9308	141.9308	141.9308	141.9308	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	175.2139	193.9868	175.2139	181.0543	175.2139	181.0543	175.2139	175.2139	181.0543	175.2139	181.0543	175.2139	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	277.6773	280.5587	273.2977	257.8397	238.3267	219.9873	207.7354	204.8540	212.1151	227.5731	247.0860	265.4255	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.1931	37.1931	37.1931	37.1931	37.1931	37.1931	37.1931	37.1931	37.1931	37.1931	37.1931	37.1931	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-113.5447	-113.5447	-113.5447	-113.5447	-113.5447	-113.5447	-113.5447	-113.5447	-113.5447	-113.5447	-113.5447	-113.5447	(71)
Water heating gains (Table 5)	157.1593	154.4834	149.3290	138.0322	131.1125	123.8797	119.4375	123.1079	127.4111	135.4367	146.2660	155.7149	(72)
Total internal gains	675.6297	694.6082	663.4197	642.5054	610.2323	590.5006	567.9660	568.7550	586.1598	603.8029	639.9856	661.9335	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	4.9800	19.6403	0.3000	0.0000	0.7700	22.5938	(76)
West	3.5300	19.6403	0.3000	0.0000	0.7700	16.0153	(80)

Solar gains	38.6090	75.5274	124.3829	181.4051	222.3188	227.5828	216.6681	186.1147	144.6625	89.6197	48.1409	31.7502	(83)
Total gains	714.2387	770.1356	787.8027	823.9105	832.5511	818.0834	784.6342	754.8697	730.8223	693.4225	688.1265	693.6837	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	29.8506	30.0383	30.2283	31.2159	31.4212	32.4896	32.4896	32.7120	32.0536	31.4212	31.0132	30.6158	
alpha	2.9900	3.0026	3.0152	3.0811	3.0947	3.1660	3.1660	3.1808	3.1369	3.0947	3.0675	3.0411	
util living area	0.9331	0.9138	0.8867	0.8198	0.7187	0.5570	0.4223	0.4517	0.6426	0.8252	0.9045	0.9370	(86)
Living	19.1678	19.3977	19.7283	20.2310	20.6131	20.8814	20.9629	20.9539	20.8013	20.3309	19.7276	19.1782	
Non living	18.5981	18.8264	19.1533	19.6538	20.0148	20.2674	20.3302	20.3283	20.1957	19.7576	19.1678	18.6202	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.0627	19.3977	19.7283	20.2310	20.6131	20.8814	20.9629	20.9539	20.8013	20.3309	19.7276	19.4330	(87)
Th 2	20.2976	20.3017	20.3058	20.3264	20.3305	20.3512	20.3512	20.3553	20.3429	20.3305	20.3223	20.3140	(88)
util rest of house	0.9263	0.9052	0.8750	0.8008	0.6883	0.5119	0.3655	0.3951	0.5996	0.8035	0.8938	0.9307	(89)
MIT 2	19.4282	18.8264	19.1533	19.6538	20.0148	20.2674	20.3302	20.3283	20.1957	19.7576	19.1678	18.8571	(90)
Living area fraction										fLA = Living area / (4) =		0.2542	(91)
MIT	19.5895	18.9716	19.2995	19.8005	20.1669	20.4235	20.4911	20.4873	20.3497	19.9033	19.3101	19.0035	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5895	18.9716	19.2995	19.8005	20.1669	20.4235	20.4911	20.4873	20.3497	19.9033	19.3101	19.0035	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9186	0.8857	0.8552	0.7845	0.6803	0.5171	0.3780	0.4070	0.6000	0.7879	0.8749	0.9162	(94)
Useful gains	656.0956	682.1369	673.7456	646.3387	566.4161	423.0173	296.5874	307.2357	438.5138	546.3822	602.0495	635.5596	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1309.8900	1198.0164	1082.8600	893.0296	689.1194	458.3899	306.2805	319.5393	498.6260	757.1989	1006.8533	1236.5568	(97)
Space heating kWh	486.4231	346.6710	304.3811	177.6175	91.2912	0.0000	0.0000	0.0000	0.0000	156.8477	291.4587	447.1420	(98a)
Space heating requirement - total per year (kWh/year)												2301.8323	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	486.4231	346.6710	304.3811	177.6175	91.2912	0.0000	0.0000	0.0000	0.0000	156.8477	291.4587	447.1420	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2301.8323	
Space heating per m2										(98c) / (4) =		20.1279	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	277.7331	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	486.4231	346.6710	304.3811	177.6175	91.2912	0.0000	0.0000	0.0000	0.0000	156.8477	291.4587	447.1420	(98)
Space heating efficiency (main heating system 1)	277.7331	277.7331	277.7331	277.7331	277.7331	0.0000	0.0000	0.0000	0.0000	277.7331	277.7331	277.7331	(210)
Space heating fuel (main heating system)	175.1405	124.8216	109.5948	63.9526	32.8701	0.0000	0.0000	0.0000	0.0000	56.4742	104.9420	160.9970	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	281.7634	249.0879	264.2424	231.2561	223.4813	200.6103	197.3574	205.5702	208.2572	233.1570	249.0858	278.5315	(64)
Efficiency of water heater												279.7468	(216)
(217)m	279.7468	279.7468	279.7468	279.7468	279.7468	279.7468	279.7468	279.7468	279.7468	279.7468	279.7468	279.7468	(217)
Fuel for water heating, kWh/month	100.7209	89.0405	94.4577	82.6662	79.8870	71.7114	70.5486	73.4844	74.4449	83.3457	89.0397	99.5656	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	42.9637	38.8059	42.9637	41.5778	42.9637	41.5778	42.9637	42.9637	41.5778	42.9637	41.5778	42.9637	(231)
Lighting	36.4060	29.2062	26.2970	19.2663	14.8818	12.1586	13.5757	17.6462	22.9207	30.0732	33.9676	37.4178	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													

(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	828.7928	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	279.7468	
Water heating fuel used	1008.9124	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.3580)		
mechanical ventilation fans (SFP = 1.3580)	505.8632	(230a)
Total electricity for the above, kWh/year	505.8632	(231)
Electricity for lighting (calculated in Appendix L)	293.8171	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2637.3855	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	828.7928	0.1551	128.5407	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1008.9124	0.1410	142.2403	(264)
Space and water heating			270.7810	(265)
Pumps, fans and electric keep-hot	505.8632	0.1387	70.1695	(267)
Energy for lighting	293.8171	0.1443	42.4069	(268)
Total CO2, kg/year			383.3574	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.3500	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	828.7928	1.5742	1304.6619	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1008.9124	1.5213	1534.8699	(278)
Space and water heating			2839.5318	(279)
Pumps, fans and electric keep-hot	505.8632	1.5128	765.2698	(281)
Energy for lighting	293.8171	1.5338	450.6665	(282)
Total Primary energy kWh/year			4055.4680	(286)
Dwelling Primary energy Rate (DPER)			35.4600	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)			Volume (m3)	
Main dwelling							
Ground floor	41.1800	(1b)	x 2.4800	(2b)	=	102.1264	(1b) - (3b)
First floor	49.7800	(1c)	x 2.7800	(2c)	=	138.3884	(1c) - (3c)
Second floor	23.4000	(1d)	x 2.7700	(2d)	=	64.8180	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	114.3600						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)		=	305.3328	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	4 * 10 =	40.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1310	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	

Measured/design AP50	5.0000	(17)
Infiltration rate	0.3810	(18)
Number of sides sheltered	2	(19)
Shelter factor (20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) =	0.3239	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4129	0.4048	0.3967	0.3562	0.3481	0.3077	0.3077	0.2996	0.3239	0.3481	0.3643	0.3805	(22b)
Effective ac	0.5852	0.5819	0.5787	0.5635	0.5606	0.5473	0.5473	0.5449	0.5524	0.5606	0.5664	0.5724	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			4.1400	1.0000	4.1400			(26)
TER Opening Type			8.5100	1.1450	9.7443			(27)
GF			41.1800	0.1300	5.3534			(28a)
Exposed Floor			8.6000	0.1300	1.1180			(28b)
Main	88.5000	12.6500	75.8500	0.1800	13.6530			(29a)
Dwarf Wall (PIRx0.72)	16.7700		16.7700	0.1800	3.0186			(29a)
PIJ	15.5100		15.5100	0.1100	1.7061			(30)
PIR	12.2300		12.2300	0.1100	1.3453			(30)
Residual Ceiling	26.3800		26.3800	0.1100	2.9018			(30)
Total net area of external elements Aum(A, m2)			209.1700					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		42.9805			(33)
Main dwelling								
Party Wall 1			88.2100	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 80.5050 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	8.6300	0.0500	0.4315
E3 Sill	8.6300	0.0500	0.4315
E4 Jamb	28.2000	0.0500	1.4100
E5 Ground floor (normal)	13.8200	0.1600	2.2112
E11 Eaves (insulation at rafter level)	18.1000	0.0400	0.7240
E16 Corner (normal)	16.0400	0.0900	1.4436
E12 Gable (insulation at ceiling level)	5.6600	0.0600	0.3396
E6 Intermediate floor within a dwelling	30.5000	0.0000	0.0000
E17 Corner (inverted - internal area greater than external area)	2.4800	-0.0900	-0.2232
P1 Party wall - Ground floor	15.2800	0.0800	1.2224
E20 Exposed floor (normal)	6.4400	0.3200	2.0608
E21 Exposed floor (inverted)	12.0800	0.3200	3.8656
E13 Gable (insulation at rafter level)	8.2800	0.0800	0.6624
E18 Party wall between dwellings	16.0800	0.0600	0.9648
R6 Flat ceiling	18.1000	0.0600	1.0860
E25 Staggered party wall between dwellings	4.9600	0.0600	0.2976

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	16.9278	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	59.9083	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	58.9696	58.6360	58.3091	56.7734	56.4861	55.1486	55.1486	54.9010	55.6638	56.4861	57.0674	57.6750	(38)
Heat transfer coeff	118.8778	118.5443	118.2174	116.6817	116.3944	115.0569	115.0569	114.8092	115.5721	116.3944	116.9756	117.5833	(39)
Average = Sum(39)m / 12 =												116.6803	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0395	1.0366	1.0337	1.0203	1.0178	1.0061	1.0061	1.0039	1.0106	1.0178	1.0229	1.0282	(40)
HLP (average)												1.0203	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.8386	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
71.8141	70.7349	69.1622	66.1532	63.9327	61.4564	60.0488	61.6096	63.3204	65.9793	69.0529	71.5389	(42a)

Hot water usage for baths

31.0056	30.5451	29.8967	28.7011	27.8058	26.8131	26.2769	26.9208	27.6219	28.6841	29.9044	30.9008	(42b)

Hot water usage for other uses

43.7003	42.1112	40.5221	38.9330	37.3439	35.7548	35.7548	37.3439	38.9330	40.5221	42.1112	43.7003	(42c)

Average daily hot water use (litres/day)	134.6848 (43)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use												
146.5200	143.3912	139.5810	133.7873	129.0824	124.0242	122.0805	125.8742	129.8753	135.1855	141.0684	146.1400	(44)
Energy conte 232.0518	204.1871	214.5308	183.1481	173.7697	152.5023	147.6458	155.8586	160.1492	183.4454	200.9778	228.8199	(45)
Energy content (annual)										Total = Sum(45)m =		2237.0865	
Distribution loss (46)m = 0.15 x (45)m													
34.8078	30.6281	32.1796	27.4722	26.0655	22.8753	22.1469	23.3788	24.0224	27.5168	30.1467	34.3230	(46)

Water storage loss:	
Store volume	210.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):	1.7016 (48)
Temperature factor from Table 2b	0.5400 (49)
Enter (49) or (54) in (55)	0.9188 (55)

Total storage loss

28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842	(56)

If cylinder contains dedicated solar storage

28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

283.7984	250.9260	266.2774	233.2255	225.5163	202.5796	199.3923	207.6052	210.2266	235.1920	251.0552	280.5665	(62)
WWHRS -32.8304	-29.0355	-30.4043	-25.1759	-23.4631	-20.0775	-18.8195	-20.0126	-20.7730	-24.4890	-27.7431	-32.2224	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

	250.9680	221.8905	235.8731	208.0495	202.0532	182.5021	180.5729	187.5926	189.4536	210.7029	223.3120	248.3441 (64)
										Total per year (kWh/year) = Sum(64)m =		2541.3146 (64)
12Total per year (kWh/year)												2541 (64)
Electric shower(s)												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000 (64a)
Heat gains from water heating, kWh/month												
	118.5545	105.2833	112.7288	100.9586	99.1757	90.7689	90.4895	93.2203	93.3115	102.3929	106.8870	117.4799 (65)

5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	141.9308	141.9308	141.9308	141.9308	141.9308	141.9308	141.9308	141.9308	141.9308	141.9308	141.9308	141.9308	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	171.3007	189.6543	171.3007	177.0107	171.3007	177.0107	171.3007	171.3007	177.0107	171.3007	177.0107	171.3007	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	277.6773	280.5587	273.2977	257.8397	238.3267	219.9873	207.7354	204.8540	212.1151	227.5731	247.0860	265.4255	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	37.1931	37.1931	37.1931	37.1931	37.1931	37.1931	37.1931	37.1931	37.1931	37.1931	37.1931	37.1931	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-113.5447	-113.5447	-113.5447	-113.5447	-113.5447	-113.5447	-113.5447	-113.5447	-113.5447	-113.5447	-113.5447	-113.5447	(71)
Water heating gains (Table 5)													
	159.3475	156.6716	151.5171	140.2203	133.3007	126.0679	121.6257	125.2960	129.5993	137.6248	148.4542	157.9031	(72)
Total internal gains													
	676.9047	695.4639	664.6947	643.6499	611.5073	588.6451	566.2410	567.0300	584.3043	605.0778	641.1302	663.2085	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	4.9800	19.6403	0.6300	0.7000	0.7700	29.8916	(76)
West	3.5300	19.6403	0.6300	0.7000	0.7700	21.1882	(80)

Solar gains	51.0797	99.9228	164.5586	239.9990	294.1277	301.0921	286.6519	246.2298	191.3885	118.5668	63.6904	42.0055	(83)
Total gains	727.9844	795.3867	829.2534	883.6489	905.6350	889.7372	852.8929	813.2597	775.6928	723.6447	704.8206	705.2140	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	21.5126	21.5732	21.6328	21.9175	21.9716	22.2270	22.2270	22.2750	22.1280	21.9716	21.8625	21.7495	
alpha	2.4342	2.4382	2.4422	2.4612	2.4648	2.4818	2.4818	2.4850	2.4752	2.4648	2.4575	2.4500	
util living area													
	0.9431	0.9274	0.9045	0.8529	0.7717	0.6427	0.5146	0.5493	0.7220	0.8640	0.9231	0.9469	(86)
MIT	18.2576	18.5245	18.9594	19.5991	20.1827	20.6478	20.8558	20.8255	20.4927	19.7529	18.9263	18.2259	(87)
Th 2	20.0505	20.0530	20.0553	20.0664	20.0685	20.0783	20.0783	20.0801	20.0745	20.0685	20.0643	20.0599	(88)
util rest of house													
	0.9362	0.9186	0.8923	0.8326	0.7368	0.5828	0.4282	0.4649	0.6697	0.8413	0.9124	0.9405	(89)
MIT 2	16.8238	17.1620	17.7126	18.5173	19.2298	19.7712	19.9821	19.9579	19.6057	18.7199	17.6813	16.7888	(90)
Living area fraction										fLA = Living area / (4) =		0.2542	(91)
MIT	17.1883	17.5083	18.0295	18.7923	19.4720	19.9940	20.2042	20.1785	19.8312	18.9825	17.9978	17.1541	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.1883	17.5083	18.0295	18.7923	19.4720	19.9940	20.2042	20.1785	19.8312	18.9825	17.9978	17.1541	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9070	0.8865	0.8580	0.7987	0.7110	0.5768	0.4408	0.4746	0.6541	0.8082	0.8804	0.9125	(94)
Useful gains	660.2817	705.1418	711.4699	705.7343	643.8900	513.1839	375.9596	385.9937	507.3963	584.8740	620.4953	643.4751	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1532.1301	1494.6451	1362.9915	1154.2523	904.6195	620.6180	414.6908	433.8033	662.3630	975.6752	1274.7778	1523.1907	(97)
Space heating kWh													
	648.6552	530.5462	484.7320	322.9330	193.9827	0.0000	0.0000	0.0000	0.0000	290.7561	471.0834	654.5085	(98a)
Space heating requirement - total per year (kWh/year)												3597.1971	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	648.6552	530.5462	484.7320	322.9330	193.9827	0.0000	0.0000	0.0000	0.0000	290.7561	471.0834	654.5085	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3597.1971	
Space heating per m2											(98c) / (4) =	31.4550	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	648.6552	530.5462	484.7320	322.9330	193.9827	0.0000	0.0000	0.0000	0.0000	290.7561	471.0834	654.5085	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	702.7684	574.8063	525.1701	349.8732	210.1654	0.0000	0.0000	0.0000	0.0000	315.0120	510.3829	709.1099	(211)

Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	250.9680	221.8905	235.8731	208.0495	202.0532	182.5021	180.5729	187.5926	189.4536	210.7029	223.3120	248.3441	(64)
Efficiency of water heater												79.8000	(216)
(217)m	86.0913	85.9417	85.6385	85.0420	83.9684	79.8000	79.8000	79.8000	79.8000	84.7823	85.6920	86.1281	(217)
Fuel for water heating, kWh/month													
	291.5137	258.1873	275.4287	244.6433	240.6299	228.6994	226.2818	235.0784	237.4105	248.5224	260.5986	288.3427	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	35.5929	28.5539	25.7097	18.8360	14.5495	11.8870	13.2725	17.2521	22.4088	29.4015	33.2090	36.5821	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-40.1505	-57.4355	-83.7040	-95.3995	-103.8898	-97.2733	-96.0652	-90.2272	-80.0387	-66.2890	-44.4354	-34.6149	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-20.1452	-42.6749	-85.3971	-129.1151	-171.5774	-172.7576	-170.7354	-144.1603	-105.1306	-61.3145	-26.9854	-15.9080	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	3897.2883	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	3035.3368	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	287.2551	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-2035.4247	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	5270.4555	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3897.2883	0.2100	818.4305	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3035.3368	0.2100	637.4207	(264)
Space and water heating			1455.8513	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	287.2551	0.1443	41.4598	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-889.5231	0.1343	-119.4700	
PV Unit electricity exported	-1145.9016	0.1257	-144.0363	
Total			-263.5063	(269)
Total CO2, kg/year			1245.7340	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.8900	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	3897.2883	1.1300	4403.9358	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3035.3368	1.1300	3429.9306	(278)
Space and water heating			7833.8663	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	287.2551	1.5338	440.6014	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-889.5231	1.4964	-1331.0503	
PV Unit electricity exported	-1145.9016	0.4614	-528.7010	
Total			-1859.7513	(283)
Total Primary energy kWh/year			6544.8172	(286)
Target Primary Energy Rate (TPER)			57.2300	(287)

Full SAP Calculation Printout

Property Reference	78449-16	**Issued on Date**	03/10/2025
Assessment Reference	001	**Prop Type Ref**	Mid
Property	824 Rochdale Road, MANCHESTER, M9 8FA		

SAP Rating	84 B	**DER**	3.35	**TER**	10.89
Environmental	97 A	**% DER < TER**			69.24
CO_2 Emissions (t/year)	0.37	**DFEE**	32.64	**TFEE**	36.91
Compliance Check	See BREL	**% DFEE < TFEE**			11.56
% DPER < TPER	38.04	**DPER**	35.46	**TPER**	57.23

Assessor Details	Mr. Daniel Goddard	**Assessor ID**	CP52-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	41.1800 (1b)	x	2.4800 (2b)	=	102.1264	(1b) - (3b)
First floor	49.7800 (1c)	x	2.7800 (2c)	=	138.3884	(1c) - (3c)
Second floor	23.4000 (1d)	x	2.7700 (2d)	=	64.8180	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	114.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	305.3328	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	4 * 10 =	40.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1310	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3810	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3239	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4129	0.4048	0.3967	0.3562	0.3481	0.3077	0.3077	0.2996	0.3239	0.3481	0.3643	0.3805	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5852	0.5819	0.5787	0.5635	0.5606	0.5473	0.5473	0.5449	0.5524	0.5606	0.5664	0.5724	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door			4.1400	1.0000	4.1400			(26)
Window			8.5100	0.7752	6.5969			(27)
GF			41.1800	0.0900	3.7062	75.0000	3088.5000	(28a)
Exposed Floor			8.6000	0.1400	1.2040	20.0000	172.0000	(28b)
Main	88.5000	12.6500	75.8500	0.1300	9.8605	9.0000	682.6500	(29a)
Dwarf Wall (PIRx0.72)	16.7700		16.7700	0.0900	1.5093	9.0000	150.9300	(29a)
PIJ	15.5100		15.5100	0.1300	2.0163	9.0000	139.5900	(30)
PIR	12.2300		12.2300	0.1300	1.5899	9.0000	110.0700	(30)
Residual Ceiling	26.3800		26.3800	0.0900	2.3742	9.0000	237.4200	(30)
Total net area of external elements Aum(A, m2)			209.1700					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		32.9973			(33)
Main dwelling								
Party Wall 1			88.2100	0.0000	0.0000	20.0000	1764.2000	(32)
Timber			124.1700			9.0000	1117.5300	(32c)
FF			41.1800			18.0000	741.2400	(32d)
SF			23.4000			18.0000	421.2000	(32d)

GF	41.1800		9.0000	370.6200 (32e)
FF	23.4000		9.0000	210.6000 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 9206.5500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 80.5050 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	8.6300	0.1150	0.9925
E3 Sill	8.6300	0.0170	0.1467
E4 Jamb	28.2000	0.0940	2.6508
E5 Ground floor (normal)	13.8200	0.0670	0.9259
E11 Eaves (insulation at rafter level)	18.1000	0.0250	0.4525
E16 Corner (normal)	16.0400	0.0680	1.0907
E12 Gable (insulation at ceiling level)	5.6600	0.0770	0.4358
E6 Intermediate floor within a dwelling	30.5000	0.0320	0.9760
E17 Corner (inverted - internal area greater than external area)	2.4800	-0.0290	-0.0719
P1 Party wall - Ground floor	15.2800	0.3200	4.8896
E20 Exposed floor (normal)	6.4400	0.0790	0.5088
E21 Exposed floor (inverted)	12.0800	0.0630	0.7610
E13 Gable (insulation at rafter level)	8.2800	0.0740	0.6127
E18 Party wall between dwellings	16.0800	0.0920	1.4794
R6 Flat ceiling	18.1000	-0.0430	-0.7783
E25 Staggered party wall between dwellings	4.9600	0.0560	0.2778

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 15.3500 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 48.3473 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	58.9696	58.6360	58.3091	56.7734	56.4861	55.1486	55.1486	54.9010	55.6638	56.4861	57.0674	57.6750	(38)

Heat transfer coeff

	107.3168	106.9833	106.6563	105.1207	104.8334	103.4959	103.4959	103.2482	104.0111	104.8334	105.4146	106.0223	(39)

Average = Sum(39)m / 12 = 105.1193

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9384	0.9355	0.9326	0.9192	0.9167	0.9050	0.9050	0.9028	0.9095	0.9167	0.9218	0.9271	(40)
HLP (average)												0.9192	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.8386 (42)
Hot water usage for mixer showers

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

	31.0056	30.5451	29.8967	28.7011	27.8058	26.8131	26.2769	26.9208	27.6219	28.6841	29.9044	30.9008	(42b)

Hot water usage for other uses

	43.7003	42.1112	40.5221	38.9330	37.3439	35.7548	35.7548	37.3439	38.9330	40.5221	42.1112	43.7003	(42c)

Average daily hot water use (litres/day) 68.4746 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	74.7059	72.6563	70.4188	67.6340	65.1497	62.5679	62.0317	64.2647	66.5549	69.2062	72.0156	74.6011	(44)
Energy conte	118.3159	103.4616	108.2310	92.5876	87.7040	76.9345	75.0219	79.5731	82.0688	93.9122	102.5994	116.8073	(45)

Energy content (annual) Total = Sum(45)m = 1137.2173
Distribution loss (46)m = 0.15 x (45)m

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss:
Total storage loss

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

	100.5685	87.9424	91.9964	78.6995	74.5484	65.3943	63.7686	67.6371	69.7585	79.8253	87.2095	99.2862	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

	100.5685	87.9424	91.9964	78.6995	74.5484	65.3943	63.7686	67.6371	69.7585	79.8253	87.2095	99.2862	(64)

Total per year (kWh/year) = Sum(64)m = 966.6347 (64)
12Total per year (kWh/year) 967 (64)
Electric shower(s)

	57.5111	51.2429	55.9553	53.3974	54.3994	51.8917	53.6215	54.3994	53.3974	55.9553	54.9031	57.5111	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 654.1855 (64a)
Heat gains from water heating, kWh/month

	39.5199	34.7963	36.9879	33.0242	32.2369	29.3215	29.3475	30.5091	30.7890	33.9452	35.5281	39.1993	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	141.9308	141.9308	141.9308	141.9308	141.9308	141.9308	141.9308	141.9308	141.9308	141.9308	141.9308	141.9308	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	175.2139	193.9868	175.2139	181.0543	175.2139	181.0543	175.2139	175.2139	181.0543	175.2139	181.0543	175.2139	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	277.6773	280.5587	273.2977	257.8397	238.3267	219.9873	207.7354	204.8540	212.1151	227.5731	247.0860	265.4255	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	37.1931	37.1931	37.1931	37.1931	37.1931	37.1931	37.1931	37.1931	37.1931	37.1931	37.1931	37.1931	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

	-113.5447	-113.5447	-113.5447	-113.5447	-113.5447	-113.5447	-113.5447	-113.5447	-113.5447	-113.5447	-113.5447	-113.5447	(71)

Water heating gains (Table 5)

	53.1181	51.7802	49.7149	45.8670	43.3292	40.7243	39.4456	41.0069	42.7625	45.6252	49.3446	52.6873	(72)

Total internal gains

	571.5886	591.9050	563.8057	550.3402	522.4490	507.3452	487.9741	486.6540	501.5111	513.9914	543.0642	558.9058	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	4.9800	19.6403	0.3000	0.0000	0.7700	22.5938	(76)
West	3.5300	19.6403	0.3000	0.0000	0.7700	16.0153	(80)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	38.6090	75.5274	124.3829	181.4051	222.3188	227.5828	216.6681	186.1147	144.6625	89.6197	48.1409	31.7502	(83)
Total gains	610.1976	667.4324	688.1886	731.7453	744.7678	734.9280	704.6423	672.7687	646.1736	603.6111	591.2052	590.6560	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	23.8301	23.9044	23.9777	24.3280	24.3947	24.7099	24.7099	24.7692	24.5875	24.3947	24.2602	24.1211	
alpha	2.5887	2.5936	2.5985	2.6219	2.6263	2.6473	2.6473	2.6513	2.6392	2.6263	2.6173	2.6081	
util living area	0.9586	0.9458	0.9284	0.8848	0.8133	0.6871	0.5559	0.5914	0.7621	0.8930	0.9424	0.9617	(86)
MIT	18.3404	18.5931	18.9956	19.6128	20.1790	20.6482	20.8577	20.8275	20.4976	19.7742	18.9851	18.3144	(87)
Th 2	20.1350	20.1374	20.1398	20.1512	20.1533	20.1633	20.1633	20.1651	20.1594	20.1533	20.1490	20.1445	(88)
util rest of house	0.9536	0.9393	0.9192	0.8686	0.7838	0.6326	0.4738	0.5119	0.7161	0.8750	0.9344	0.9571	(89)
MIT 2	17.6732	17.9245	18.3240	18.9359	19.4809	19.9155	20.0851	20.0660	19.7858	19.1007	18.3226	17.6538	(90)
Living area fraction										fLA = Living area / (4) =		0.2542	(91)
MIT	17.8428	18.0945	18.4948	19.1080	19.6583	20.1017	20.2815	20.2595	19.9667	19.2719	18.4910	17.8217	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.8428	18.0945	18.4948	19.1080	19.6583	20.1017	20.2815	20.2595	19.9667	19.2719	18.4910	17.8217	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9358	0.9190	0.8966	0.8446	0.7640	0.6282	0.4862	0.5216	0.7041	0.8518	0.9139	0.9402	(94)
Useful gains	571.0188	613.3412	617.0586	618.0194	568.9803	461.6682	342.5722	350.9408	454.9920	514.1635	540.3061	555.3510	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1453.3671	1411.5884	1279.3171	1073.0690	834.2980	569.4066	381.0211	398.4906	610.2017	909.1052	1200.7772	1444.2041	(97)
Space heating kWh	656.4671	536.4222	492.7204	327.6357	197.3963	0.0000	0.0000	0.0000	0.0000	293.8366	475.5392	661.3067	(98a)
Space heating requirement - total per year (kWh/year)												3641.3242	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	656.4671	536.4222	492.7204	327.6357	197.3963	0.0000	0.0000	0.0000	0.0000	293.8366	475.5392	661.3067	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3641.3242	
Space heating per m2										(98c) / (4) =		31.8409	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	972.8615	765.8697	784.6865	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.6325	0.7087	0.6821	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	615.3481	542.7598	535.2318	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	762.0426	730.9548	697.4705	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	105.6201	140.0170	120.7056	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	26.4050	35.0043	30.1764	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												91.5857	(107)
Energy for space heating												31.8409	(99)
Energy for space cooling												0.8009	(108)
Total												32.6417	(109)
Fabric Energy Efficiency (DFEE)												32.6	(109)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	41.1800	(1b)	x 2.4800	(2b) =	102.1264	(1b) - (3b)
First floor	49.7800	(1c)	x 2.7800	(2c) =	138.3884	(1c) - (3c)
Second floor	23.4000	(1d)	x 2.7700	(2d) =	64.8180	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	114.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		305.3328	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	4 * 10 =	40.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1310	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3810	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3239	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4129	0.4048	0.3967	0.3562	0.3481	0.3077	0.3077	0.2996	0.3239	0.3481	0.3643	0.3805	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0.0000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5852	0.5819	0.5787	0.5635	0.5606	0.5473	0.5473	0.5449	0.5524	0.5606	0.5664	0.5724	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			4.1400	1.0000	4.1400			(26)
TER Opening Type			8.5100	1.1450	9.7443			(27)
GF			41.1800	0.1300	5.3534			(28a)
Exposed Floor			8.6000	0.1300	1.1180			(28b)
Main	88.5000	12.6500	75.8500	0.1800	13.6530			(29a)
Dwarf Wall (PIRx0.72)	16.7700		16.7700	0.1800	3.0186			(29a)
PIJ	15.5100		15.5100	0.1100	1.7061			(30)
PIR	12.2300		12.2300	0.1100	1.3453			(30)
Residual Ceiling	26.3800		26.3800	0.1100	2.9018			(30)
Total net area of external elements Aum(A, m2)			209.1700					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		42.9805			(33)
Main dwelling								
Party Wall 1			88.2100	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	80.5050 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	8.6300	0.0500	0.4315
E3 Sill	8.6300	0.0500	0.4315
E4 Jamb	28.2000	0.0500	1.4100
E5 Ground floor (normal)	13.8200	0.1600	2.2112
E11 Eaves (insulation at rafter level)	18.1000	0.0400	0.7240
E16 Corner (normal)	16.0400	0.0900	1.4436
E12 Gable (insulation at ceiling level)	5.6600	0.0600	0.3396
E6 Intermediate floor within a dwelling	30.5000	0.0000	0.0000
E17 Corner (inverted - internal area greater than external area)	2.4800	-0.0900	-0.2232
P1 Party wall - Ground floor	15.2800	0.0800	1.2224
E20 Exposed floor (normal)	6.4400	0.3200	2.0608
E21 Exposed floor (inverted)	12.0800	0.3200	3.8656
E13 Gable (insulation at rafter level)	8.2800	0.0800	0.6624
E18 Party wall between dwellings	16.0800	0.0600	0.9648
R6 Flat ceiling	18.1000	0.0600	1.0860
E25 Staggered party wall between dwellings	4.9600	0.0600	0.2976

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		16.9278 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	59.9083 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	58.9696	58.6360	58.3091	56.7734	56.4861	55.1486	55.1486	54.9010	55.6638	56.4861	57.0674	57.6750	(38)
Heat transfer coeff	118.8778	118.5443	118.2174	116.6817	116.3944	115.0569	115.0569	114.8092	115.5721	116.3944	116.9756	117.5833	(39)

Average = Sum(39)m / 12 =	116.6803

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0395	1.0366	1.0337	1.0203	1.0178	1.0061	1.0061	1.0039	1.0106	1.0178	1.0229	1.0282	(40)
HLP (average)												1.0203	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.8386 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	31.0056	30.5451	29.8967	28.7011	27.8058	26.8131	26.2769	26.9208	27.6219	28.6841	29.9044	30.9008	(42b)
Hot water usage for other uses	43.7003	42.1112	40.5221	38.9330	37.3439	35.7548	35.7548	37.3439	38.9330	40.5221	42.1112	43.7003	(42c)

Average daily hot water use (litres/day)	68.4746 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	74.7059	72.6563	70.4188	67.6340	65.1497	62.5679	62.0317	64.2647	66.5549	69.2062	72.0156	74.6011	(44)
Energy conte	118.3159	103.4616	108.2310	92.5876	87.7040	76.9345	75.0219	79.5731	82.0688	93.9122	102.5994	116.8073	(45)

Energy content (annual)	Total = Sum(45)m =	1137.2173

Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss:
Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

100.5685	87.9424	91.9964	78.6995	74.5484	65.3943	63.7686	67.6371	69.7585	79.8253	87.2095	99.2862	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

100.5685	87.9424	91.9964	78.6995	74.5484	65.3943	63.7686	67.6371	69.7585	79.8253	87.2095	99.2862	(64)

Total per year (kWh/year) = Sum(64)m = 966.6347 (64)

12Total per year (kWh/year) 967 (64)

Electric shower(s)

57.5111	51.2429	55.9553	53.3974	54.3994	51.8917	53.6215	54.3994	53.3974	55.9553	54.9031	57.5111	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 654.1855 (64a)

Heat gains from water heating, kWh/month

39.5199	34.7963	36.9879	33.0242	32.2369	29.3215	29.3475	30.5091	30.7890	33.9452	35.5281	39.1993	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	141.9308	141.9308	141.9308	141.9308	141.9308	141.9308	141.9308	141.9308	141.9308	141.9308	141.9308	141.9308	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

171.3007	189.6543	171.3007	177.0107	171.3007	177.0107	171.3007	171.3007	177.0107	171.3007	177.0107	171.3007	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

277.6773	280.5587	273.2977	257.8397	238.3267	219.9873	207.7354	204.8540	212.1151	227.5731	247.0860	265.4255	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

37.1931	37.1931	37.1931	37.1931	37.1931	37.1931	37.1931	37.1931	37.1931	37.1931	37.1931	37.1931	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

-113.5447	-113.5447	-113.5447	-113.5447	-113.5447	-113.5447	-113.5447	-113.5447	-113.5447	-113.5447	-113.5447	-113.5447	(71)

Water heating gains (Table 5)

53.1181	51.7802	49.7149	45.8670	43.3292	40.7243	39.4456	41.0069	42.7625	45.6252	49.3446	52.6873	(72)

Total internal gains

567.6754	587.5725	559.8925	546.2966	518.5359	503.3016	484.0609	482.7408	497.4675	510.0782	539.0206	554.9926	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	4.9800	19.6403	0.6300	0.7000	0.7700	29.8916	(76)
West	3.5300	19.6403	0.6300	0.7000	0.7700	21.1882	(80)

Solar gains 51.0797	99.9228	164.5586	239.9990	294.1277	301.0921	286.6519	246.2298	191.3885	118.5668	63.6904	42.0055	(83)
Total gains 618.7551	687.4954	724.4511	786.2955	812.6636	804.3936	770.7129	728.9706	688.8560	628.6451	602.7111	596.9981	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	21.5126	21.5732	21.6328	21.9175	21.9716	22.2270	22.2270	22.2750	22.1280	21.9716	21.8625	21.7495	
alpha	2.4342	2.4382	2.4422	2.4612	2.4648	2.4818	2.4818	2.4850	2.4752	2.4648	2.4575	2.4500	
util living area	0.9589	0.9453	0.9257	0.8791	0.8047	0.6807	0.5535	0.5917	0.7623	0.8934	0.9432	0.9622	(86)
MIT	18.0608	18.3390	18.7912	19.4663	20.0870	20.5957	20.8295	20.7926	20.4180	19.6175	18.7517	18.0279	(87)
Th 2	20.0505	20.0530	20.0553	20.0664	20.0685	20.0783	20.0783	20.0801	20.0745	20.0685	20.0643	20.0599	(88)
util rest of house	0.9538	0.9384	0.9157	0.8615	0.7726	0.6218	0.4646	0.5057	0.7131	0.8744	0.9349	0.9574	(89)
MIT 2	17.3429	17.6192	18.0676	18.7350	19.3309	19.7996	19.9881	19.9647	19.6487	18.8915	18.0381	17.3162	(90)
Living area fraction									fLA = Living area / (4) =			0.2542	(91)
MIT	17.5254	17.8022	18.2515	18.9209	19.5231	20.0020	20.2019	20.1751	19.8442	19.0761	18.2195	17.4971	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.5254	17.8022	18.2515	18.9209	19.5231	20.0020	20.2019	20.1751	19.8442	19.0761	18.2195	17.4971	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9347	0.9163	0.8908	0.8348	0.7506	0.6164	0.4775	0.5154	0.6990	0.8488	0.9129	0.9394	(94)
Useful gains	578.3424	629.9492	645.3524	656.4167	609.9964	495.8204	367.9924	375.7205	481.4933	533.5980	550.1925	560.8037	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1572.2059	1529.4769	1389.2331	1169.2585	910.5638	621.5350	414.4286	433.4184	663.8732	986.5672	1300.7058	1563.5203	(97)
Space heating kWh	739.4344	604.4826	553.4472	369.2461	223.6221	0.0000	0.0000	0.0000	0.0000	337.0091	540.3695	746.0212	(98a)

Space heating requirement - total per year (kWh/year) 4113.6323

Solar heating kWh 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)

Solar heating contribution - total per year (kWh/year) 0.0000

Space heating kWh 739.4344	604.4826	553.4472	369.2461	223.6221	0.0000	0.0000	0.0000	0.0000	337.0091	540.3695	746.0212	(98c)

Space heating requirement after solar contribution - total per year (kWh/year) 4113.6323

Space heating per m2 (98c) / (4) = 35.9709 (99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	1081.5350	851.4212	872.5502	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.6219	0.6959	0.6659	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	672.5615	592.4864	581.0402	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	847.6202	812.3840	767.2540	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	126.0422	163.6038	138.5430	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	31.5106	40.9010	34.6358	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												107.0473	(107)
Energy for space heating												35.9709	(99)
Energy for space cooling												0.9361	(108)
Total												36.9070	(109)
Fabric Energy Efficiency (TFEE)												36.9	(109)

Full SAP Calculation Printout

Property Reference	78449-16	**Issued on Date**	03/10/2025
Assessment Reference	001	**Prop Type Ref**	Mid
Property	824 Rochdale Road, MANCHESTER, M9 8FA		

SAP Rating	84 B	**DER**	3.35	**TER**	10.89
Environmental	97 A	**% DER < TER**			69.24
CO_2 Emissions (t/year)	0.37	**DFEE**	32.64	**TFEE**	36.91
Compliance Check	See BREL	**% DFEE < TFEE**			11.56
% DPER < TPER	38.04	**DPER**	35.46	**TPER**	57.23

Assessor Details	Mr. Daniel Goddard	**Assessor ID**	CP52-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	41.1800 (1b)	x	2.4800 (2b)	=	102.1264	(1b) - (3b)
First floor	49.7800 (1c)	x	2.7800 (2c)	=	138.3884	(1c) - (3c)
Second floor	23.4000 (1d)	x	2.7700 (2d)	=	64.8180	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	114.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	305.3328	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.2500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2125	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2709	0.2656	0.2603	0.2338	0.2284	0.2019	0.2019	0.1966	0.2125	0.2284	0.2391	0.2497	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	80.1000 (23c)

Effective ac	0.3704	0.3651	0.3598	0.3332	0.3279	0.3014	0.3014	0.2961	0.3120	0.3279	0.3386	0.3492	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door			4.1400	1.0000	4.1400			(26)
Window			8.5100	0.7752	6.5969			(27)
GF			41.1800	0.0900	3.7062	75.0000	3088.5000	(28a)
Exposed Floor			8.6000	0.1400	1.2040	20.0000	172.0000	(28b)
Main	88.5000	12.6500	75.8500	0.1300	9.8605	9.0000	682.6500	(29a)
Dwarf Wall (PIRx0.72)	16.7700		16.7700	0.0900	1.5093	9.0000	150.9300	(29a)
PIJ	15.5100		15.5100	0.1300	2.0163	9.0000	139.5900	(30)
PIR	12.2300		12.2300	0.1300	1.5899	9.0000	110.0700	(30)
Residual Ceiling	26.3800		26.3800	0.0900	2.3742	9.0000	237.4200	(30)
Total net area of external elements Aum(A, m2)			209.1700					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		32.9973			(33)
Main dwelling								
Party Wall 1			88.2100	0.0000	0.0000	20.0000	1764.2000	(32)

Timber	124.1700		9.0000	1117.5300 (32c)
FF	41.1800		18.0000	741.2400 (32d)
SF	23.4000		18.0000	421.2000 (32d)
GF	41.1800		9.0000	370.6200 (32e)
FF	23.4000		9.0000	210.6000 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 9206.5500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 80.5050 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	8.6300	0.1150	0.9925
E3 Sill	8.6300	0.0170	0.1467
E4 Jamb	28.2000	0.0940	2.6508
E5 Ground floor (normal)	13.8200	0.0670	0.9259
E11 Eaves (insulation at rafter level)	18.1000	0.0250	0.4525
E16 Corner (normal)	16.0400	0.0680	1.0907
E12 Gable (insulation at ceiling level)	5.6600	0.0770	0.4358
E6 Intermediate floor within a dwelling	30.5000	0.0320	0.9760
E17 Corner (inverted - internal area greater than external area)	2.4800	-0.0290	-0.0719
P1 Party wall - Ground floor	15.2800	0.3200	4.8896
E20 Exposed floor (normal)	6.4400	0.0790	0.5088
E21 Exposed floor (inverted)	12.0800	0.0630	0.7610
E13 Gable (insulation at rafter level)	8.2800	0.0740	0.6127
E18 Party wall between dwellings	16.0800	0.0920	1.4794
R6 Flat ceiling	18.1000	-0.0430	-0.7783
E25 Staggered party wall between dwellings	4.9600	0.0560	0.2778

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 15.3500 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 48.3473 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	37.3252	36.7899	36.2546	33.5782	33.0429	30.3665	30.3665	29.8312	31.4371	33.0429	34.1135	35.1841	(38)
Heat transfer coeff	85.6725	85.1372	84.6019	81.9255	81.3902	78.7138	78.7138	78.1785	79.7843	81.3902	82.4608	83.5313	(39)
Average = Sum(39)m / 12 =												81.7916	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7491	0.7445	0.7398	0.7164	0.7117	0.6883	0.6883	0.6836	0.6977	0.7117	0.7211	0.7304	(40)
HLP (average)												0.7152	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.8386 (42)
Hot water usage for mixer showers

71.8141	70.7349	69.1622	66.1532	63.9327	61.4564	60.0488	61.6096	63.3204	65.9793	69.0529	71.5389	(42a)

Hot water usage for baths

31.0056	30.5451	29.8967	28.7011	27.8058	26.8131	26.2769	26.9208	27.6219	28.6841	29.9044	30.9008	(42b)

Hot water usage for other uses

43.7003	42.1112	40.5221	38.9330	37.3439	35.7548	35.7548	37.3439	38.9330	40.5221	42.1112	43.7003	(42c)

Average daily hot water use (litres/day) 134.6848 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	146.5200	143.3912	139.5810	133.7873	129.0824	124.0242	122.0805	125.8742	129.8753	135.1855	141.0684	146.1400	(44)
Energy conte	232.0518	204.1871	214.5308	183.1481	173.7697	152.5023	147.6458	155.8586	160.1492	183.4454	200.9778	228.8199	(45)
Energy content (annual)										Total = Sum(45)m =		2237.0865	
Distribution loss (46)m = 0.15 x (45)m	34.8078	30.6281	32.1796	27.4722	26.0655	22.8753	22.1469	23.3788	24.0224	27.5168	30.1467	34.3230	(46)
Water storage loss:													
Store volume												210.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5800	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8532	(55)
Total storage loss	26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(56)
If cylinder contains dedicated solar storage	26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	281.7634	249.0879	264.2424	231.2561	223.4813	200.6103	197.3574	205.5702	208.2572	233.1570	249.0858	278.5315	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	281.7634	249.0879	264.2424	231.2561	223.4813	200.6103	197.3574	205.5702	208.2572	233.1570	249.0858	278.5315	(64)
										Total per year (kWh/year) = Sum(64)m =		2822.4005	(64)
12Total per year (kWh/year)												2822	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	116.9265	103.8129	111.1008	99.3831	97.5477	89.1934	88.8615	91.5923	91.7360	100.7649	105.3115	115.8519	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	141.9308	141.9308	141.9308	141.9308	141.9308	141.9308	141.9308	141.9308	141.9308	141.9308	141.9308	141.9308	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	175.2139	193.9868	175.2139	181.0543	175.2139	181.0543	175.2139	175.2139	181.0543	175.2139	181.0543	175.2139	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	277.6773	280.5587	273.2977	257.8397	238.3267	219.9873	207.7354	204.8540	212.1151	227.5731	247.0860	265.4255	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.1931	37.1931	37.1931	37.1931	37.1931	37.1931	37.1931	37.1931	37.1931	37.1931	37.1931	37.1931	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-113.5447	-113.5447	-113.5447	-113.5447	-113.5447	-113.5447	-113.5447	-113.5447	-113.5447	-113.5447	-113.5447	-113.5447	(71)
Water heating gains (Table 5)	157.1593	154.4834	149.3290	138.0322	131.1125	123.8797	119.4375	123.1079	127.4111	135.4367	146.2660	155.7149	(72)
Total internal gains	675.6297	694.6082	663.4197	642.5054	610.2323	590.5006	567.9660	568.7550	586.1598	603.8029	639.9856	661.9335	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	4.9800	19.6403	0.3000	0.0000	0.7700	22.5938	(76)
West	3.5300	19.6403	0.3000	0.0000	0.7700	16.0153	(80)

Solar gains	38.6090	75.5274	124.3829	181.4051	222.3188	227.5828	216.6681	186.1147	144.6625	89.6197	48.1409	31.7502	(83)
Total gains	714.2387	770.1356	787.8027	823.9105	832.5511	818.0834	784.6342	754.8697	730.8223	693.4225	688.1265	693.6837	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	29.8506	30.0383	30.2283	31.2159	31.4212	32.4896	32.4896	32.7120	32.0536	31.4212	31.0132	30.6158	
alpha	2.9900	3.0026	3.0152	3.0811	3.0947	3.1660	3.1660	3.1808	3.1369	3.0947	3.0675	3.0411	
util living area	0.9331	0.9138	0.8867	0.8198	0.7187	0.5570	0.4223	0.4517	0.6426	0.8252	0.9045	0.9370	(86)
Living	19.1678	19.3977	19.7283	20.2310	20.6131	20.8814	20.9629	20.9539	20.8013	20.3309	19.7276	19.1782	
Non living	18.5981	18.8264	19.1533	19.6538	20.0148	20.2674	20.3302	20.3283	20.1957	19.7576	19.1678	18.6202	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.0627	19.3977	19.7283	20.2310	20.6131	20.8814	20.9629	20.9539	20.8013	20.3309	19.7276	19.4330	(87)
Th 2	20.2976	20.3017	20.3058	20.3264	20.3305	20.3512	20.3512	20.3553	20.3429	20.3305	20.3223	20.3140	(88)
util rest of house	0.9263	0.9052	0.8750	0.8008	0.6883	0.5119	0.3655	0.3951	0.5996	0.8035	0.8938	0.9307	(89)
MIT 2	19.4282	18.8264	19.1533	19.6538	20.0148	20.2674	20.3302	20.3283	20.1957	19.7576	19.1678	18.8571	(90)
Living area fraction										fLA = Living area / (4) =		0.2542	(91)
MIT	19.5895	18.9716	19.2995	19.8005	20.1669	20.4235	20.4911	20.4873	20.3497	19.9033	19.3101	19.0035	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5895	18.9716	19.2995	19.8005	20.1669	20.4235	20.4911	20.4873	20.3497	19.9033	19.3101	19.0035	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9186	0.8857	0.8552	0.7845	0.6803	0.5171	0.3780	0.4070	0.6000	0.7879	0.8749	0.9162	(94)
Useful gains	656.0956	682.1369	673.7456	646.3387	566.4161	423.0173	296.5874	307.2357	438.5138	546.3822	602.0495	635.5596	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1309.8900	1198.0164	1082.8600	893.0296	689.1194	458.3899	306.2805	319.5393	498.6260	757.1989	1006.8533	1236.5568	(97)
Space heating kWh	486.4231	346.6710	304.3811	177.6175	91.2912	0.0000	0.0000	0.0000	0.0000	156.8477	291.4587	447.1420	(98a)
Space heating requirement - total per year (kWh/year)												2301.8323	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	486.4231	346.6710	304.3811	177.6175	91.2912	0.0000	0.0000	0.0000	0.0000	156.8477	291.4587	447.1420	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2301.8323	
Space heating per m2										(98c) / (4) =		20.1279	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	277.7331	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	486.4231	346.6710	304.3811	177.6175	91.2912	0.0000	0.0000	0.0000	0.0000	156.8477	291.4587	447.1420	(98)
Space heating efficiency (main heating system 1)	277.7331	277.7331	277.7331	277.7331	277.7331	0.0000	0.0000	0.0000	0.0000	277.7331	277.7331	277.7331	(210)
Space heating fuel (main heating system)	175.1405	124.8216	109.5948	63.9526	32.8701	0.0000	0.0000	0.0000	0.0000	56.4742	104.9420	160.9970	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	281.7634	249.0879	264.2424	231.2561	223.4813	200.6103	197.3574	205.5702	208.2572	233.1570	249.0858	278.5315	(64)
Efficiency of water heater												279.7468	(216)
(217)m	279.7468	279.7468	279.7468	279.7468	279.7468	279.7468	279.7468	279.7468	279.7468	279.7468	279.7468	279.7468	(217)
Fuel for water heating, kWh/month	100.7209	89.0405	94.4577	82.6662	79.8870	71.7114	70.5486	73.4844	74.4449	83.3457	89.0397	99.5656	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	42.9637	38.8059	42.9637	41.5778	42.9637	41.5778	42.9637	42.9637	41.5778	42.9637	41.5778	42.9637	(231)
Lighting	36.4060	29.2062	26.2970	19.2663	14.8818	12.1586	13.5757	17.6462	22.9207	30.0732	33.9676	37.4178	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													

(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	828.7928	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	279.7468	
Water heating fuel used	1008.9124	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.3580)		
mechanical ventilation fans (SFP = 1.3580)	505.8632	(230a)
Total electricity for the above, kWh/year	505.8632	(231)
Electricity for lighting (calculated in Appendix L)	293.8171	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2637.3855	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	828.7928	0.1551	128.5407	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1008.9124	0.1410	142.2403	(264)
Space and water heating			270.7810	(265)
Pumps, fans and electric keep-hot	505.8632	0.1387	70.1695	(267)
Energy for lighting	293.8171	0.1443	42.4069	(268)
Total CO2, kg/year			383.3574	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.3500	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	828.7928	1.5742	1304.6619	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1008.9124	1.5213	1534.8699	(278)
Space and water heating			2839.5318	(279)
Pumps, fans and electric keep-hot	505.8632	1.5128	765.2698	(281)
Energy for lighting	293.8171	1.5338	450.6665	(282)
Total Primary energy kWh/year			4055.4680	(286)
Dwelling Primary energy Rate (DPER)			35.4600	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)			Volume (m3)	
Main dwelling							
Ground floor	41.1800	(1b)	x 2.4800	(2b)	=	102.1264	(1b) - (3b)
First floor	49.7800	(1c)	x 2.7800	(2c)	=	138.3884	(1c) - (3c)
Second floor	23.4000	(1d)	x 2.7700	(2d)	=	64.8180	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	114.3600						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)		=	305.3328	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	4 * 10 =	40.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1310	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	

Measured/design AP50	5.0000	(17)
Infiltration rate	0.3810	(18)
Number of sides sheltered	2	(19)
Shelter factor (20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) =	0.3239	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4129	0.4048	0.3967	0.3562	0.3481	0.3077	0.3077	0.2996	0.3239	0.3481	0.3643	0.3805	(22b)
Effective ac	0.5852	0.5819	0.5787	0.5635	0.5606	0.5473	0.5473	0.5449	0.5524	0.5606	0.5664	0.5724	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			4.1400	1.0000	4.1400			(26)
TER Opening Type			8.5100	1.1450	9.7443			(27)
GF			41.1800	0.1300	5.3534			(28a)
Exposed Floor			8.6000	0.1300	1.1180			(28b)
Main	88.5000	12.6500	75.8500	0.1800	13.6530			(29a)
Dwarf Wall (PIRx0.72)	16.7700		16.7700	0.1800	3.0186			(29a)
PIJ	15.5100		15.5100	0.1100	1.7061			(30)
PIR	12.2300		12.2300	0.1100	1.3453			(30)
Residual Ceiling	26.3800		26.3800	0.1100	2.9018			(30)
Total net area of external elements Aum(A, m2)			209.1700					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		42.9805			(33)
Main dwelling								
Party Wall 1			88.2100	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 80.5050 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	8.6300	0.0500	0.4315
E3 Sill	8.6300	0.0500	0.4315
E4 Jamb	28.2000	0.0500	1.4100
E5 Ground floor (normal)	13.8200	0.1600	2.2112
E11 Eaves (insulation at rafter level)	18.1000	0.0400	0.7240
E16 Corner (normal)	16.0400	0.0900	1.4436
E12 Gable (insulation at ceiling level)	5.6600	0.0600	0.3396
E6 Intermediate floor within a dwelling	30.5000	0.0000	0.0000
E17 Corner (inverted - internal area greater than external area)	2.4800	-0.0900	-0.2232
P1 Party wall - Ground floor	15.2800	0.0800	1.2224
E20 Exposed floor (normal)	6.4400	0.3200	2.0608
E21 Exposed floor (inverted)	12.0800	0.3200	3.8656
E13 Gable (insulation at rafter level)	8.2800	0.0800	0.6624
E18 Party wall between dwellings	16.0800	0.0600	0.9648
R6 Flat ceiling	18.1000	0.0600	1.0860
E25 Staggered party wall between dwellings	4.9600	0.0600	0.2976

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	16.9278	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	59.9083	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	58.9696	58.6360	58.3091	56.7734	56.4861	55.1486	55.1486	54.9010	55.6638	56.4861	57.0674	57.6750	(38)
Heat transfer coeff	118.8778	118.5443	118.2174	116.6817	116.3944	115.0569	115.0569	114.8092	115.5721	116.3944	116.9756	117.5833	(39)
Average = Sum(39)m / 12 =												116.6803	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0395	1.0366	1.0337	1.0203	1.0178	1.0061	1.0061	1.0039	1.0106	1.0178	1.0229	1.0282	(40)
HLP (average)												1.0203	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.8386	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
71.8141	70.7349	69.1622	66.1532	63.9327	61.4564	60.0488	61.6096	63.3204	65.9793	69.0529	71.5389	(42a)

Hot water usage for baths

31.0056	30.5451	29.8967	28.7011	27.8058	26.8131	26.2769	26.9208	27.6219	28.6841	29.9044	30.9008	(42b)

Hot water usage for other uses

43.7003	42.1112	40.5221	38.9330	37.3439	35.7548	35.7548	37.3439	38.9330	40.5221	42.1112	43.7003	(42c)

Average daily hot water use (litres/day)	134.6848 (43)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use												
146.5200	143.3912	139.5810	133.7873	129.0824	124.0242	122.0805	125.8742	129.8753	135.1855	141.0684	146.1400	(44)
Energy conte 232.0518	204.1871	214.5308	183.1481	173.7697	152.5023	147.6458	155.8586	160.1492	183.4454	200.9778	228.8199	(45)
Energy content (annual)										Total = Sum(45)m =		2237.0865	
Distribution loss (46)m = 0.15 x (45)m													
34.8078	30.6281	32.1796	27.4722	26.0655	22.8753	22.1469	23.3788	24.0224	27.5168	30.1467	34.3230	(46)

Water storage loss:	
Store volume	210.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):	1.7016 (48)
Temperature factor from Table 2b	0.5400 (49)
Enter (49) or (54) in (55)	0.9188 (55)

Total storage loss

28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842	(56)

If cylinder contains dedicated solar storage

28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

283.7984	250.9260	266.2774	233.2255	225.5163	202.5796	199.3923	207.6052	210.2266	235.1920	251.0552	280.5665	(62)
WWHRS -32.8304	-29.0355	-30.4043	-25.1759	-23.4631	-20.0775	-18.8195	-20.0126	-20.7730	-24.4890	-27.7431	-32.2224	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

	250.9680	221.8905	235.8731	208.0495	202.0532	182.5021	180.5729	187.5926	189.4536	210.7029	223.3120	248.3441 (64)
										Total per year (kWh/year) = Sum(64)m =		2541.3146 (64)
12Total per year (kWh/year)												2541 (64)
Electric shower(s)												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000 (64a)
Heat gains from water heating, kWh/month												
	118.5545	105.2833	112.7288	100.9586	99.1757	90.7689	90.4895	93.2203	93.3115	102.3929	106.8870	117.4799 (65)

5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	141.9308	141.9308	141.9308	141.9308	141.9308	141.9308	141.9308	141.9308	141.9308	141.9308	141.9308	141.9308	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	171.3007	189.6543	171.3007	177.0107	171.3007	177.0107	171.3007	171.3007	177.0107	171.3007	177.0107	171.3007	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	277.6773	280.5587	273.2977	257.8397	238.3267	219.9873	207.7354	204.8540	212.1151	227.5731	247.0860	265.4255	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	37.1931	37.1931	37.1931	37.1931	37.1931	37.1931	37.1931	37.1931	37.1931	37.1931	37.1931	37.1931	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-113.5447	-113.5447	-113.5447	-113.5447	-113.5447	-113.5447	-113.5447	-113.5447	-113.5447	-113.5447	-113.5447	-113.5447	(71)
Water heating gains (Table 5)													
	159.3475	156.6716	151.5171	140.2203	133.3007	126.0679	121.6257	125.2960	129.5993	137.6248	148.4542	157.9031	(72)
Total internal gains													
	676.9047	695.4639	664.6947	643.6499	611.5073	588.6451	566.2410	567.0300	584.3043	605.0778	641.1302	663.2085	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	4.9800	19.6403	0.6300	0.7000	0.7700	29.8916	(76)
West	3.5300	19.6403	0.6300	0.7000	0.7700	21.1882	(80)

Solar gains	51.0797	99.9228	164.5586	239.9990	294.1277	301.0921	286.6519	246.2298	191.3885	118.5668	63.6904	42.0055	(83)
Total gains	727.9844	795.3867	829.2534	883.6489	905.6350	889.7372	852.8929	813.2597	775.6928	723.6447	704.8206	705.2140	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	21.5126	21.5732	21.6328	21.9175	21.9716	22.2270	22.2270	22.2750	22.1280	21.9716	21.8625	21.7495	
alpha	2.4342	2.4382	2.4422	2.4612	2.4648	2.4818	2.4818	2.4850	2.4752	2.4648	2.4575	2.4500	
util living area													
	0.9431	0.9274	0.9045	0.8529	0.7717	0.6427	0.5146	0.5493	0.7220	0.8640	0.9231	0.9469	(86)
MIT	18.2576	18.5245	18.9594	19.5991	20.1827	20.6478	20.8558	20.8255	20.4927	19.7529	18.9263	18.2259	(87)
Th 2	20.0505	20.0530	20.0553	20.0664	20.0685	20.0783	20.0783	20.0801	20.0745	20.0685	20.0643	20.0599	(88)
util rest of house													
	0.9362	0.9186	0.8923	0.8326	0.7368	0.5828	0.4282	0.4649	0.6697	0.8413	0.9124	0.9405	(89)
MIT 2	16.8238	17.1620	17.7126	18.5173	19.2298	19.7712	19.9821	19.9579	19.6057	18.7199	17.6813	16.7888	(90)
Living area fraction										fLA = Living area / (4) =		0.2542	(91)
MIT	17.1883	17.5083	18.0295	18.7923	19.4720	19.9940	20.2042	20.1785	19.8312	18.9825	17.9978	17.1541	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.1883	17.5083	18.0295	18.7923	19.4720	19.9940	20.2042	20.1785	19.8312	18.9825	17.9978	17.1541	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9070	0.8865	0.8580	0.7987	0.7110	0.5768	0.4408	0.4746	0.6541	0.8082	0.8804	0.9125	(94)
Useful gains	660.2817	705.1418	711.4699	705.7343	643.8900	513.1839	375.9596	385.9937	507.3963	584.8740	620.4953	643.4751	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1532.1301	1494.6451	1362.9915	1154.2523	904.6195	620.6180	414.6908	433.8033	662.3630	975.6752	1274.7778	1523.1907	(97)
Space heating kWh													
	648.6552	530.5462	484.7320	322.9330	193.9827	0.0000	0.0000	0.0000	0.0000	290.7561	471.0834	654.5085	(98a)
Space heating requirement - total per year (kWh/year)												3597.1971	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	648.6552	530.5462	484.7320	322.9330	193.9827	0.0000	0.0000	0.0000	0.0000	290.7561	471.0834	654.5085	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3597.1971	
Space heating per m2											(98c) / (4) =	31.4550	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	648.6552	530.5462	484.7320	322.9330	193.9827	0.0000	0.0000	0.0000	0.0000	290.7561	471.0834	654.5085	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	702.7684	574.8063	525.1701	349.8732	210.1654	0.0000	0.0000	0.0000	0.0000	315.0120	510.3829	709.1099	(211)

Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	250.9680	221.8905	235.8731	208.0495	202.0532	182.5021	180.5729	187.5926	189.4536	210.7029	223.3120	248.3441	(64)
Efficiency of water heater												79.8000	(216)
(217)m	86.0913	85.9417	85.6385	85.0420	83.9684	79.8000	79.8000	79.8000	79.8000	84.7823	85.6920	86.1281	(217)
Fuel for water heating, kWh/month													
	291.5137	258.1873	275.4287	244.6433	240.6299	228.6994	226.2818	235.0784	237.4105	248.5224	260.5986	288.3427	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	35.5929	28.5539	25.7097	18.8360	14.5495	11.8870	13.2725	17.2521	22.4088	29.4015	33.2090	36.5821	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-40.1505	-57.4355	-83.7040	-95.3995	-103.8898	-97.2733	-96.0652	-90.2272	-80.0387	-66.2890	-44.4354	-34.6149	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-20.1452	-42.6749	-85.3971	-129.1151	-171.5774	-172.7576	-170.7354	-144.1603	-105.1306	-61.3145	-26.9854	-15.9080	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	3897.2883	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	3035.3368	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	287.2551	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-2035.4247	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	5270.4555	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3897.2883	0.2100	818.4305	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3035.3368	0.2100	637.4207	(264)
Space and water heating			1455.8513	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	287.2551	0.1443	41.4598	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-889.5231	0.1343	-119.4700	
PV Unit electricity exported	-1145.9016	0.1257	-144.0363	
Total			-263.5063	(269)
Total CO2, kg/year			1245.7340	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.8900	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	3897.2883	1.1300	4403.9358	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3035.3368	1.1300	3429.9306	(278)
Space and water heating			7833.8663	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	287.2551	1.5338	440.6014	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-889.5231	1.4964	-1331.0503	
PV Unit electricity exported	-1145.9016	0.4614	-528.7010	
Total			-1859.7513	(283)
Total Primary energy kWh/year			6544.8172	(286)
Target Primary Energy Rate (TPER)			57.2300	(287)

Full SAP Calculation Printout

Property Reference	78449-16	**Issued on Date**	03/10/2025
Assessment Reference	001	**Prop Type Ref**	Mid
Property	824 Rochdale Road, MANCHESTER, M9 8FA		

SAP Rating	84 B	**DER**	3.35	**TER**	10.89
Environmental	97 A	**% DER < TER**			69.24
CO_2 Emissions (t/year)	0.37	**DFEE**	32.64	**TFEE**	36.91
Compliance Check	See BREL	**% DFEE < TFEE**			11.56
% DPER < TPER	38.04	**DPER**	35.46	**TPER**	57.23

Assessor Details	Mr. Daniel Goddard	**Assessor ID**	CP52-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	41.1800 (1b)	x	2.4800 (2b)	=	102.1264	(1b) - (3b)
First floor	49.7800 (1c)	x	2.7800 (2c)	=	138.3884	(1c) - (3c)
Second floor	23.4000 (1d)	x	2.7700 (2d)	=	64.8180	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	114.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	305.3328	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.2500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2125	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2709	0.2656	0.2603	0.2338	0.2284	0.2019	0.2019	0.1966	0.2125	0.2284	0.2391	0.2497	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	80.1000 (23c)

Effective ac	0.3704	0.3651	0.3598	0.3332	0.3279	0.3014	0.3014	0.2961	0.3120	0.3279	0.3386	0.3492	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door			4.1400	1.0000	4.1400			(26)
Window			8.5100	0.7752	6.5969			(27)
GF			41.1800	0.0900	3.7062	75.0000	3088.5000	(28a)
Exposed Floor			8.6000	0.1400	1.2040	20.0000	172.0000	(28b)
Main	88.5000	12.6500	75.8500	0.1300	9.8605	9.0000	682.6500	(29a)
Dwarf Wall (PIRx0.72)	16.7700		16.7700	0.0900	1.5093	9.0000	150.9300	(29a)
PIJ	15.5100		15.5100	0.1300	2.0163	9.0000	139.5900	(30)
PIR	12.2300		12.2300	0.1300	1.5899	9.0000	110.0700	(30)
Residual Ceiling	26.3800		26.3800	0.0900	2.3742	9.0000	237.4200	(30)
Total net area of external elements Aum(A, m2)			209.1700					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		32.9973			(33)
Main dwelling								
Party Wall 1			88.2100	0.0000	0.0000	20.0000	1764.2000	(32)

Timber	124.1700		9.0000	1117.5300 (32c)
FF	41.1800		18.0000	741.2400 (32d)
SF	23.4000		18.0000	421.2000 (32d)
GF	41.1800		9.0000	370.6200 (32e)
FF	23.4000		9.0000	210.6000 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 9206.5500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 80.5050 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	8.6300	0.1150	0.9925
E3 Sill	8.6300	0.0170	0.1467
E4 Jamb	28.2000	0.0940	2.6508
E5 Ground floor (normal)	13.8200	0.0670	0.9259
E11 Eaves (insulation at rafter level)	18.1000	0.0250	0.4525
E16 Corner (normal)	16.0400	0.0680	1.0907
E12 Gable (insulation at ceiling level)	5.6600	0.0770	0.4358
E6 Intermediate floor within a dwelling	30.5000	0.0320	0.9760
E17 Corner (inverted - internal area greater than external area)	2.4800	-0.0290	-0.0719
P1 Party wall - Ground floor	15.2800	0.3200	4.8896
E20 Exposed floor (normal)	6.4400	0.0790	0.5088
E21 Exposed floor (inverted)	12.0800	0.0630	0.7610
E13 Gable (insulation at rafter level)	8.2800	0.0740	0.6127
E18 Party wall between dwellings	16.0800	0.0920	1.4794
R6 Flat ceiling	18.1000	-0.0430	-0.7783
E25 Staggered party wall between dwellings	4.9600	0.0560	0.2778

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 15.3500 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 48.3473 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	37.3252	36.7899	36.2546	33.5782	33.0429	30.3665	30.3665	29.8312	31.4371	33.0429	34.1135	35.1841	(38)
Heat transfer coeff	85.6725	85.1372	84.6019	81.9255	81.3902	78.7138	78.7138	78.1785	79.7843	81.3902	82.4608	83.5313	(39)
Average = Sum(39)m / 12 =												81.7916	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7491	0.7445	0.7398	0.7164	0.7117	0.6883	0.6883	0.6836	0.6977	0.7117	0.7211	0.7304	(40)
HLP (average)												0.7152	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.8386 (42)
Hot water usage for mixer showers

71.8141	70.7349	69.1622	66.1532	63.9327	61.4564	60.0488	61.6096	63.3204	65.9793	69.0529	71.5389	(42a)

Hot water usage for baths

31.0056	30.5451	29.8967	28.7011	27.8058	26.8131	26.2769	26.9208	27.6219	28.6841	29.9044	30.9008	(42b)

Hot water usage for other uses

43.7003	42.1112	40.5221	38.9330	37.3439	35.7548	35.7548	37.3439	38.9330	40.5221	42.1112	43.7003	(42c)

Average daily hot water use (litres/day) 134.6848 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	146.5200	143.3912	139.5810	133.7873	129.0824	124.0242	122.0805	125.8742	129.8753	135.1855	141.0684	146.1400	(44)
Energy conte	232.0518	204.1871	214.5308	183.1481	173.7697	152.5023	147.6458	155.8586	160.1492	183.4454	200.9778	228.8199	(45)
Energy content (annual)										Total = Sum(45)m =		2237.0865	

Distribution loss (46)m = 0.15 x (45)m

34.8078	30.6281	32.1796	27.4722	26.0655	22.8753	22.1469	23.3788	24.0224	27.5168	30.1467	34.3230	(46)

Water storage loss:
Store volume 210.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.5800 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.8532 (55)
Total storage loss

26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(56)

If cylinder contains dedicated solar storage

26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

281.7634	249.0879	264.2424	231.2561	223.4813	200.6103	197.3574	205.5702	208.2572	233.1570	249.0858	278.5315	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

281.7634	249.0879	264.2424	231.2561	223.4813	200.6103	197.3574	205.5702	208.2572	233.1570	249.0858	278.5315	(64)
									Total per year (kWh/year) = Sum(64)m =		2822.4005	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)

Heat gains from water heating, kWh/month

116.9265	103.8129	111.1008	99.3831	97.5477	89.1934	88.8615	91.5923	91.7360	100.7649	105.3115	115.8519	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	170.3170	170.3170	170.3170	170.3170	170.3170	170.3170	170.3170	170.3170	170.3170	170.3170	170.3170	170.3170	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	41.5929	36.9424	30.0436	22.7449	17.0021	14.3539	15.5099	20.1603	27.0592	34.3578	40.1006	42.7488	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	414.4438	418.7444	407.9069	384.8353	355.7115	328.3392	310.0529	305.7522	316.5897	339.6613	368.7851	396.1574	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	54.8703	54.8703	54.8703	54.8703	54.8703	54.8703	54.8703	54.8703	54.8703	54.8703	54.8703	54.8703	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-113.5447	-113.5447	-113.5447	-113.5447	-113.5447	-113.5447	-113.5447	-113.5447	-113.5447	-113.5447	-113.5447	-113.5447	(71)
Water heating gains (Table 5)	157.1593	154.4834	149.3290	138.0322	131.1125	123.8797	119.4375	123.1079	127.4111	135.4367	146.2660	155.7149	(72)
Total internal gains	724.8386	721.8129	698.9222	657.2550	615.4687	578.2155	556.6429	560.6631	582.7026	621.0984	666.7944	706.2638	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	4.9800	19.6403	0.3000	0.0000	0.7700	22.5938	(76)
West	3.5300	19.6403	0.3000	0.0000	0.7700	16.0153	(80)

Solar gains	38.6090	75.5274	124.3829	181.4051	222.3188	227.5828	216.6681	186.1147	144.6625	89.6197	48.1409	31.7502	(83)
Total gains	763.4476	797.3403	823.3051	838.6601	837.7875	805.7983	773.3110	746.7778	727.3651	710.7181	714.9353	738.0140	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	29.8506	30.0383	30.2283	31.2159	31.4212	32.4896	32.4896	32.7120	32.0536	31.4212	31.0132	30.6158	
alpha	2.9900	3.0026	3.0152	3.0811	3.0947	3.1660	3.1660	3.1808	3.1369	3.0947	3.0675	3.0411	
util living area	0.9224	0.9072	0.8762	0.8140	0.7162	0.5635	0.4277	0.4559	0.6446	0.8173	0.8964	0.9274	(86)
Living	19.2583	19.4447	19.7833	20.2487	20.6171	20.8774	20.9616	20.9527	20.7995	20.3521	19.7725	19.2615	
Non living	18.6862	18.8718	19.2058	19.6701	20.0183	20.2645	20.3294	20.3275	20.1943	19.7769	19.2108	18.7015	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.1090	19.4447	19.7833	20.2487	20.6171	20.8774	20.9616	20.9527	20.7995	20.3521	19.7725	19.5047	(87)
Th 2	20.2976	20.3017	20.3058	20.3264	20.3305	20.3512	20.3512	20.3553	20.3429	20.3305	20.3223	20.3140	(88)
util rest of house	0.9147	0.8981	0.8637	0.7948	0.6857	0.5182	0.3704	0.3990	0.6016	0.7950	0.8850	0.9203	(89)
MIT 2	19.4733	18.8718	19.2058	19.6701	20.0183	20.2645	20.3294	20.3275	20.1943	19.7769	19.2108	18.9270	(90)
Living area fraction										fLA = Living area / (4) =		0.2542	(91)
MIT	19.6349	19.0174	19.3526	19.8172	20.1705	20.4203	20.4901	20.4864	20.3481	19.9231	19.3535	19.0739	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6349	19.0174	19.3526	19.8172	20.1705	20.4203	20.4901	20.4864	20.3481	19.9231	19.3535	19.0739	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9067	0.8783	0.8440	0.7787	0.6779	0.5232	0.3830	0.4109	0.6020	0.7799	0.8660	0.9051	(94)
Useful gains	692.1808	700.2884	694.8438	653.0541	567.9408	421.5804	296.1467	306.8320	437.8471	554.3132	619.1271	668.0122	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1313.7765	1201.9172	1087.3517	894.3969	689.4149	458.1353	306.2050	319.4701	498.5029	758.8071	1010.4361	1242.4355	(97)
Space heating kWh	462.4672	337.0946	292.0259	173.7668	90.3768	0.0000	0.0000	0.0000	0.0000	152.1434	281.7424	427.3709	(98a)
Space heating requirement - total per year (kWh/year)												2216.9880	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	462.4672	337.0946	292.0259	173.7668	90.3768	0.0000	0.0000	0.0000	0.0000	152.1434	281.7424	427.3709	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2216.9880	
Space heating per m2											(98c) / (4) =	19.3860	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	277.7331	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	462.4672	337.0946	292.0259	173.7668	90.3768	0.0000	0.0000	0.0000	0.0000	152.1434	281.7424	427.3709	(98)
Space heating efficiency (main heating system 1)	277.7331	277.7331	277.7331	277.7331	277.7331	0.0000	0.0000	0.0000	0.0000	277.7331	277.7331	277.7331	(210)
Space heating fuel (main heating system)	166.5149	121.3736	105.1462	62.5661	32.5409	0.0000	0.0000	0.0000	0.0000	54.7804	101.4436	153.8783	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	281.7634	249.0879	264.2424	231.2561	223.4813	200.6103	197.3574	205.5702	208.2572	233.1570	249.0858	278.5315	(64)
Efficiency of water heater												279.7468	(216)
(217)m	279.7468	279.7468	279.7468	279.7468	279.7468	279.7468	279.7468	279.7468	279.7468	279.7468	279.7468	279.7468	(217)
Fuel for water heating, kWh/month	100.7209	89.0405	94.4577	82.6662	79.8870	71.7114	70.5486	73.4844	74.4449	83.3457	89.0397	99.5656	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	42.9637	38.8059	42.9637	41.5778	42.9637	41.5778	42.9637	42.9637	41.5778	42.9637	41.5778	42.9637	(231)
Lighting	36.4060	29.2062	26.2970	19.2663	14.8818	12.1586	13.5757	17.6462	22.9207	30.0732	33.9676	37.4178	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)

Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	798.2440	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	279.7468	
Water heating fuel used	1008.9124	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.3580)		
mechanical ventilation fans (SFP = 1.3580)	505.8632	(230a)
Total electricity for the above, kWh/year	505.8632	(231)
Electricity for lighting (calculated in Appendix L)	293.8171	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2606.8367	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	798.2440	16.4900	131.6304	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1008.9124	16.4900	166.3697	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	505.8632	16.4900	83.4168	(249)
Energy for lighting	293.8171	16.4900	48.4504	(250)
Additional standing charges			0.0000	(251)
Total energy cost			429.8674	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.9711	(257)
SAP value		84.2587	
SAP rating (Section 12)		84	(258)
SAP band		B	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	798.2440	0.1550	123.7417	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1008.9124	0.1410	142.2403	(264)
Space and water heating			265.9820	(265)
Pumps, fans and electric keep-hot	505.8632	0.1387	70.1695	(267)
Energy for lighting	293.8171	0.1443	42.4069	(268)
Total CO2, kg/year			378.5584	(272)
CO2 emissions per m2			3.3100	(273)
EI value			96.8168	
EI rating			97	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	41.1800	(1b) x	2.4800	(2b) =	102.1264	(1b) - (3b)
First floor	49.7800	(1c) x	2.7800	(2c) =	138.3884	(1c) - (3c)
Second floor	23.4000	(1d) x	2.7700	(2d) =	64.8180	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	114.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		305.3328	(5)

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2. Ventilation rate

---

m3 per hour

Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.2500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2125	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.6000	4.5000	4.5000	4.1000	4.2000	3.7000	3.5000	3.5000	3.7000	4.1000	4.1000	4.2000	(22)
Wind factor	1.1500	1.1250	1.1250	1.0250	1.0500	0.9250	0.8750	0.8750	0.9250	1.0250	1.0250	1.0500	(22a)
Adj infilt rate	0.2444	0.2391	0.2391	0.2178	0.2231	0.1966	0.1859	0.1859	0.1966	0.2178	0.2178	0.2231	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =		80.1000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.3439	0.3386	0.3386	0.3173	0.3226	0.2961	0.2854	0.2854	0.2961	0.3173	0.3173	0.3226	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Door			4.1400	1.0000	4.1400			(26)
Window			8.5100	0.7752	6.5969			(27)
GF			41.1800	0.0900	3.7062	75.0000	3088.5000	(28a)
Exposed Floor			8.6000	0.1400	1.2040	20.0000	172.0000	(28b)
Main	88.5000	12.6500	75.8500	0.1300	9.8605	9.0000	682.6500	(29a)
Dwarf Wall (PIRx0.72)	16.7700		16.7700	0.0900	1.5093	9.0000	150.9300	(29a)
PIJ	15.5100		15.5100	0.1300	2.0163	9.0000	139.5900	(30)
PIR	12.2300		12.2300	0.1300	1.5899	9.0000	110.0700	(30)
Residual Ceiling	26.3800		26.3800	0.0900	2.3742	9.0000	237.4200	(30)
Total net area of external elements Aum(A, m2)			209.1700					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		32.9973			(33)
Main dwelling								
Party Wall 1			88.2100	0.0000	0.0000	20.0000	1764.2000	(32)
Timber			124.1700			9.0000	1117.5300	(32c)
FF			41.1800			18.0000	741.2400	(32d)
SF			23.4000			18.0000	421.2000	(32d)
GF			41.1800			9.0000	370.6200	(32e)
FF			23.4000			9.0000	210.6000	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	9206.5500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		80.5050 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	8.6300	0.1150	0.9925
E3 Sill	8.6300	0.0170	0.1467
E4 Jamb	28.2000	0.0940	2.6508
E5 Ground floor (normal)	13.8200	0.0670	0.9259
E11 Eaves (insulation at rafter level)	18.1000	0.0250	0.4525
E16 Corner (normal)	16.0400	0.0680	1.0907
E12 Gable (insulation at ceiling level)	5.6600	0.0770	0.4358
E6 Intermediate floor within a dwelling	30.5000	0.0320	0.9760
E17 Corner (inverted - internal area greater than external area)	2.4800	-0.0290	-0.0719
P1 Party wall - Ground floor	15.2800	0.3200	4.8896
E20 Exposed floor (normal)	6.4400	0.0790	0.5088
E21 Exposed floor (inverted)	12.0800	0.0630	0.7610
E13 Gable (insulation at rafter level)	8.2800	0.0740	0.6127
E18 Party wall between dwellings	16.0800	0.0920	1.4794
R6 Flat ceiling	18.1000	-0.0430	-0.7783
E25 Staggered party wall between dwellings	4.9600	0.0560	0.2778

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		15.3500 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	48.3473 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	34.6488	34.1135	34.1135	31.9724	32.5076	29.8312	28.7606	28.7606	29.8312	31.9724	31.9724	32.5076	(38)
Heat transfer coeff	82.9960	82.4608	82.4608	80.3196	80.8549	78.1785	77.1079	77.1079	78.1785	80.3196	80.3196	80.8549	(39)
Average = Sum(39)m / 12 =												80.0966	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7257	0.7211	0.7211	0.7023	0.7070	0.6836	0.6743	0.6743	0.6836	0.7023	0.7023	0.7070	(40)
HLP (average)												0.7004	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.8386 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	71.8141	70.7349	69.1622	66.1532	63.9327	61.4564	60.0488	61.6096	63.3204	65.9793	69.0529	71.5389	(42a)
Hot water usage for baths	31.0056	30.5451	29.8967	28.7011	27.8058	26.8131	26.2769	26.9208	27.6219	28.6841	29.9044	30.9008	(42b)
Hot water usage for other uses	43.7003	42.1112	40.5221	38.9330	37.3439	35.7548	35.7548	37.3439	38.9330	40.5221	42.1112	43.7003	(42c)
Average daily hot water use (litres/day)												134.6848	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	146.5200	143.3912	139.5810	133.7873	129.0824	124.0242	122.0805	125.8742	129.8753	135.1855	141.0684	146.1400	(44)
Energy conte	232.0518	204.1871	214.5308	183.1481	173.7697	152.5023	147.6458	155.8586	160.1492	183.4454	200.9778	228.8199	(45)
Energy content (annual)										Total = Sum(45)m =		2237.0865	
Distribution loss (46)m = 0.15 x (45)m													
	34.8078	30.6281	32.1796	27.4722	26.0655	22.8753	22.1469	23.3788	24.0224	27.5168	30.1467	34.3230	(46)
Water storage loss:													
Store volume												210.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5800	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8532	(55)
Total storage loss													
	26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(56)
If cylinder contains dedicated solar storage													
	26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	281.7634	249.0879	264.2424	231.2561	223.4813	200.6103	197.3574	205.5702	208.2572	233.1570	249.0858	278.5315	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	281.7634	249.0879	264.2424	231.2561	223.4813	200.6103	197.3574	205.5702	208.2572	233.1570	249.0858	278.5315	(64)
										Total per year (kWh/year) = Sum(64)m =		2822.4005	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
						Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =						0.0000	(64a)
Heat gains from water heating, kWh/month													
	116.9265	103.8129	111.1008	99.3831	97.5477	89.1934	88.8615	91.5923	91.7360	100.7649	105.3115	115.8519	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	170.3170	170.3170	170.3170	170.3170	170.3170	170.3170	170.3170	170.3170	170.3170	170.3170	170.3170	170.3170	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	41.5929	36.9424	30.0436	22.7449	17.0021	14.3539	15.5099	20.1603	27.0592	34.3578	40.1006	42.7488	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	414.4438	418.7444	407.9069	384.8353	355.7115	328.3392	310.0529	305.7522	316.5897	339.6613	368.7851	396.1574	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	54.8703	54.8703	54.8703	54.8703	54.8703	54.8703	54.8703	54.8703	54.8703	54.8703	54.8703	54.8703	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-113.5447	-113.5447	-113.5447	-113.5447	-113.5447	-113.5447	-113.5447	-113.5447	-113.5447	-113.5447	-113.5447	-113.5447	(71)
Water heating gains (Table 5)													
	157.1593	154.4834	149.3290	138.0322	131.1125	123.8797	119.4375	123.1079	127.4111	135.4367	146.2660	155.7149	(72)
Total internal gains													
	724.8386	721.8129	698.9222	657.2550	615.4687	578.2155	556.6429	560.6631	582.7026	621.0984	666.7944	706.2638	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	4.9800	16.6187	0.3000	0.0000	0.7700	19.1178	(76)
West	3.5300	16.6187	0.3000	0.0000	0.7700	13.5514	(80)

Solar gains	32.6692	67.1355	116.6090	172.9395	207.2659	216.2037	201.7650	170.7039	137.1149	82.8303	42.3057	28.7264	(83)
Total gains	757.5077	788.9484	815.5312	830.1946	822.7347	794.4192	758.4079	731.3670	719.8175	703.9288	709.1001	734.9902	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	30.8132	31.0132	31.0132	31.8400	31.6292	32.7120	33.1662	33.1662	32.7120	31.8400	31.8400	31.6292	
alpha	3.0542	3.0675	3.0675	3.1227	3.1086	3.1808	3.2111	3.2111	3.1808	3.1227	3.1227	3.1086	
util living area													
	0.9173	0.9014	0.8719	0.8021	0.6945	0.5396	0.4280	0.4507	0.6423	0.8115	0.8888	0.9219	(86)
Living	19.4052	19.5826	19.8629	20.3290	20.6771	20.9001	20.9636	20.9568	20.8094	20.3922	19.8873	19.4144	
Non living	18.8456	19.0222	19.2955	19.7564	20.0764	20.2868	20.3429	20.3385	20.2139	19.8214	19.3351	18.8669	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.1842	19.5826	19.8629	20.3290	20.6771	20.9001	20.9636	20.9568	20.8094	20.3922	19.8873	19.6362	(87)
Th 2	20.3181	20.3223	20.3223	20.3388	20.3346	20.3553	20.3636	20.3636	20.3553	20.3388	20.3388	20.3346	(88)
util rest of house													
	0.9091	0.8917	0.8591	0.7817	0.6613	0.4921	0.3717	0.3935	0.5999	0.7885	0.8767	0.9143	(89)
MIT 2	19.5649	19.0222	19.2955	19.7564	20.0764	20.2868	20.3429	20.3385	20.2139	19.8214	19.3351	19.0722	(90)
Living area fraction										fLA = Living area / (4) =		0.2542	(91)
MIT	19.7223	19.1647	19.4398	19.9020	20.2291	20.4427	20.5007	20.4957	20.3652	19.9665	19.4754	19.2156	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7223	19.1647	19.4398	19.9020	20.2291	20.4427	20.5007	20.4957	20.3652	19.9665	19.4754	19.2156	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9012	0.8725	0.8400	0.7670	0.6557	0.4988	0.3841	0.4057	0.6006	0.7742	0.8582	0.8993	(94)
Useful gains	682.6912	688.3356	685.0427	636.7319	539.4500	396.2268	291.2672	296.6936	432.3126	544.9547	608.5780	660.9836	(95)
Ext temp.	4.7000	5.3000	6.7000	9.3000	12.3000	15.0000	16.6000	16.5000	14.1000	10.8000	7.5000	4.6000	(96)
Heat loss rate W													
	1246.7905	1143.2913	1050.5305	851.5452	641.1089	425.4998	300.7735	308.0997	489.8072	736.2505	961.8618	1181.7435	(97)

Space heating kWh													
	419.6899	305.7302	271.9230	154.6655	75.6342	0.0000	0.0000	0.0000	0.0000	142.3241	254.3644	387.4454	(98a)
Space heating requirement - total per year (kWh/year)												2011.7766	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	419.6899	305.7302	271.9230	154.6655	75.6342	0.0000	0.0000	0.0000	0.0000	142.3241	254.3644	387.4454	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2011.7766	
Space heating per m2											(98c) / (4) =	17.5916	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												276.7856	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	419.6899	305.7302	271.9230	154.6655	75.6342	0.0000	0.0000	0.0000	0.0000	142.3241	254.3644	387.4454	(98)
Space heating efficiency (main heating system 1)													
	276.7856	276.7856	276.7856	276.7856	276.7856	0.0000	0.0000	0.0000	0.0000	276.7856	276.7856	276.7856	(210)
Space heating fuel (main heating system)													
	151.6300	110.4574	98.2432	55.8792	27.3259	0.0000	0.0000	0.0000	0.0000	51.4203	91.8994	139.9803	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	281.7634	249.0879	264.2424	231.2561	223.4813	200.6103	197.3574	205.5702	208.2572	233.1570	249.0858	278.5315	(64)
Efficiency of water heater												279.7563	(216)
(217)m	279.7563	279.7563	279.7563	279.7563	279.7563	279.7563	279.7563	279.7563	279.7563	279.7563	279.7563	279.7563	(217)
Fuel for water heating, kWh/month													
	100.7175	89.0375	94.4545	82.6634	79.8843	71.7089	70.5462	73.4819	74.4424	83.3429	89.0367	99.5622	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	42.9637	38.8059	42.9637	41.5778	42.9637	41.5778	42.9637	42.9637	41.5778	42.9637	41.5778	42.9637	(231)
Lighting	36.4060	29.2062	26.2970	19.2663	14.8818	12.1586	13.5757	17.6462	22.9207	30.0732	33.9676	37.4178	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												726.8358	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												279.7563	
Water heating fuel used												1008.8783	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.3580)													
mechanical ventilation fans (SFP = 1.3580)												505.8632	(230a)
Total electricity for the above, kWh/year												505.8632	(231)
Electricity for lighting (calculated in Appendix L)												293.8171	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												2535.3944	(238)

10a. Fuel costs - using BEDF prices (583)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	726.8358	28.4300	206.6394	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1008.8783	28.4300	286.8241	(247)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(247a)
Pumps, fans and electric keep-hot	505.8632	28.4300	143.8169	(249)
Energy for lighting	293.8171	28.4300	83.5322	(250)
Additional standing charges			0.0000	(251)
Total energy cost			720.8126	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	726.8358	0.1551	112.7046	(261)

Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1008.8783	0.1410	142.2355 (264)
Space and water heating			254.9401 (265)
Pumps, fans and electric keep-hot	505.8632	0.1387	70.1695 (267)
Energy for lighting	293.8171	0.1443	42.4069 (268)
Total CO2, kg/year			367.5165 (272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	726.8358	1.5741	1144.0880	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1008.8783	1.5213	1534.8180	(278)
Space and water heating			2678.9059	(279)
Pumps, fans and electric keep-hot	505.8632	1.5128	765.2698	(281)
Energy for lighting	293.8171	1.5338	450.6665	(282)
Total Primary energy kWh/year			3894.8422	(286)

SAP 10 EPC IMPROVEMENTS

001

Current energy efficiency rating: B 84
Current environmental impact rating: A 97

N Solar water heating		Recommended
U Solar photovoltaic panels		Recommended
V2 Wind turbine		Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
N Solar water heating	+ 1.3	-£ 53	-23 kg (6.3%)
U Solar photovoltaic panels	+ 7.1	-£ 287	-207 kg (60.1%)

	Typical annual savings		Energy efficiency	Environmental impact
Recommended measures				
Solar water heating	£53	0.20 kg/m²	B 86	A 97
Solar photovoltaic panels	£287	1.81 kg/m²	A 93	A 99
Total Savings	£340	2.01 kg/m²		

Potential energy efficiency rating: A 93
Potential environmental impact rating: A 99

Fuel prices for cost data on this page from database revision number 583 TEST (01 Oct 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, West Pennines (England)):

	Current	Potential	Saving
Electricity	£721	£667	£53
Space heating	£350	£376	-£26
Water heating	£287	£207	£79
Lighting	£84	£84	£0
Generated (PV)	-£0	-£287	£287
Total cost of fuels	£721	£380	£340
Total cost of uses	£721	£380	£340
Delivered energy	22 kWh/m²	6 kWh/m²	16 kWh/m²
Carbon dioxide emissions	0.4 tonnes	0.1 tonnes	0.2 tonnes
CO2 emissions per m²	3 kg/m²	1 kg/m²	2 kg/m²
Primary energy	34 kWh/m²	18 kWh/m²	17 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

1. Overall dwelling characteristics

Main dwelling	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	41.1800 (1b)	x	2.4800 (2b)	=	102.1264	(1b) - (3b)
First floor	49.7800 (1c)	x	2.7800 (2c)	=	138.3884	(1c) - (3c)
Second floor	23.4000 (1d)	x	2.7700 (2d)	=	64.8180	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	114.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	305.3328	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)

Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.2500 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2125 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2709	0.2656	0.2603	0.2338	0.2284	0.2019	0.2019	0.1966	0.2125	0.2284	0.2391	0.2497	(22b)

Balanced mechanical ventilation with heat recovery		
If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =		80.1000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.3704	0.3651	0.3598	0.3332	0.3279	0.3014	0.3014	0.2961	0.3120	0.3279	0.3386	0.3492	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Door			4.1400	1.0000	4.1400			(26)
Window			8.5100	0.7752	6.5969			(27)
GF			41.1800	0.0900	3.7062	75.0000	3088.5000	(28a)
Exposed Floor			8.6000	0.1400	1.2040	20.0000	172.0000	(28b)
Main	88.5000	12.6500	75.8500	0.1300	9.8605	9.0000	682.6500	(29a)
Dwarf Wall (PIRx0.72)	16.7700		16.7700	0.0900	1.5093	9.0000	150.9300	(29a)
PIJ	15.5100		15.5100	0.1300	2.0163	9.0000	139.5900	(30)
PIR	12.2300		12.2300	0.1300	1.5899	9.0000	110.0700	(30)
Residual Ceiling	26.3800		26.3800	0.0900	2.3742	9.0000	237.4200	(30)
Total net area of external elements Aum(A, m2)			209.1700					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		32.9973			(33)
Main dwelling								
Party Wall 1			88.2100	0.0000	0.0000	20.0000	1764.2000	(32)
Timber			124.1700			9.0000	1117.5300	(32c)
FF			41.1800			18.0000	741.2400	(32d)
SF			23.4000			18.0000	421.2000	(32d)
GF			41.1800			9.0000	370.6200	(32e)
FF			23.4000			9.0000	210.6000	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	9206.5500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		80.5050 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	8.6300	0.1150	0.9925
E3 Sill	8.6300	0.0170	0.1467
E4 Jamb	28.2000	0.0940	2.6508
E5 Ground floor (normal)	13.8200	0.0670	0.9259
E11 Eaves (insulation at rafter level)	18.1000	0.0250	0.4525
E16 Corner (normal)	16.0400	0.0680	1.0907
E12 Gable (insulation at ceiling level)	5.6600	0.0770	0.4358
E6 Intermediate floor within a dwelling	30.5000	0.0320	0.9760
E17 Corner (inverted - internal area greater than external area)	2.4800	-0.0290	-0.0719
P1 Party wall - Ground floor	15.2800	0.3200	4.8896
E20 Exposed floor (normal)	6.4400	0.0790	0.5088
E21 Exposed floor (inverted)	12.0800	0.0630	0.7610
E13 Gable (insulation at rafter level)	8.2800	0.0740	0.6127
E18 Party wall between dwellings	16.0800	0.0920	1.4794
R6 Flat ceiling	18.1000	-0.0430	-0.7783
E25 Staggered party wall between dwellings	4.9600	0.0560	0.2778

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		15.3500 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	48.3473 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	37.3252	36.7899	36.2546	33.5782	33.0429	30.3665	30.3665	29.8312	31.4371	33.0429	34.1135	35.1841	(38)
Heat transfer coeff	85.6725	85.1372	84.6019	81.9255	81.3902	78.7138	78.7138	78.1785	79.7843	81.3902	82.4608	83.5313	(39)
Average = Sum(39)m / 12 =												81.7916	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7491	0.7445	0.7398	0.7164	0.7117	0.6883	0.6883	0.6836	0.6977	0.7117	0.7211	0.7304	(40)
HLP (average)												0.7152	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.8386 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
71.8141	70.7349	69.1622	66.1532	63.9327	61.4564	60.0488	61.6096	63.3204	65.9793	69.0529	71.5389	(42a)

Hot water usage for baths

31.0056	30.5451	29.8967	28.7011	27.8058	26.8131	26.2769	26.9208	27.6219	28.6841	29.9044	30.9008	(42b)

Hot water usage for other uses

43.7003	42.1112	40.5221	38.9330	37.3439	35.7548	35.7548	37.3439	38.9330	40.5221	42.1112	43.7003	(42c)

Average daily hot water use (litres/day)	134.6848 (43)

Daily hot water use

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
146.5200	143.3912	139.5810	133.7873	129.0824	124.0242	122.0805	125.8742	129.8753	135.1855	141.0684	146.1400	(44)
Energy conte 232.0518	204.1871	214.5308	183.1481	173.7697	152.5023	147.6458	155.8586	160.1492	183.4454	200.9778	228.8199	(45)

Energy content (annual)											Total = Sum(45)m =	2237.0865	
Distribution loss (46)m = 0.15 x (45)m													
	34.8078	30.6281	32.1796	27.4722	26.0655	22.8753	22.1469	23.3788	24.0224	27.5168	30.1467	34.3230	(46)
Water storage loss:													
Store volume												210.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5800	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8532	(55)
Total storage loss													
	26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(56)
If cylinder contains dedicated solar storage													
	17.0031	15.3576	17.0031	16.4546	17.0031	16.4546	17.0031	17.0031	16.4546	17.0031	16.4546	17.0031	(57)
Primary loss	23.2624	21.0112	21.8667	15.7584	10.4681	9.9053	10.2355	11.1660	17.1091	21.8667	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	272.3173	240.5559	253.4005	215.3611	201.2408	178.8621	174.8843	184.0276	193.7129	222.3151	239.9444	269.0854	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Aperture area of solar collector												3.0000	(H1)
Zero-loss collector efficiency												0.8000	(H2)
Collector linear heat loss coefficient												1.8000	(H3)
Collector 2nd order heat loss coefficient												0.0000	(H4)
Collector loop efficiency												0.9000	(H5)
Incidence angle modifier												1.0000	(H6)
Overshading factor												0.8000	(H8)
Overall heat loss coefficient of system												6.5000	(H10)
Heat loss coefficient of collector loop												3.9667	(H11)
Dedicated solar storage volume												75.0000	(H12)
If combined cylinder, total volume of cylinder												210.0000	(H13)
Effective solar volume												115.5000	(H14)
Reference volume												225.0000	(H15)
Storage tank correction coefficient												1.1814	(H16)
Heat delivered to hot water												660.9518	(H24)
Heat delivered to space heating												0.0000	(H29)
Solar input												660.9518	
Solar input	-0.0000	-20.2118	-62.7734	-84.5765	-108.9042	-100.3033	-99.5623	-87.8023	-62.1154	-33.3714	-1.3311	-0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	272.3173	220.3441	190.6271	130.7846	92.3366	78.5588	75.3219	96.2253	131.5975	188.9437	238.6133	269.0854	(64)
										Total per year (kWh/year) = Sum(64)m =		1984.7556	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	109.3696	96.9873	102.4273	86.6671	79.7553	71.7949	70.8830	74.3582	80.1006	92.0914	97.9984	108.2950	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	170.3170	170.3170	170.3170	170.3170	170.3170	170.3170	170.3170	170.3170	170.3170	170.3170	170.3170	170.3170	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	41.5929	36.9424	30.0436	22.7449	17.0021	14.3539	15.5099	20.1603	27.0592	34.3578	40.1006	42.7488	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	414.4438	418.7444	407.9069	384.8353	355.7115	328.3392	310.0529	305.7522	316.5897	339.6613	368.7851	396.1574	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	54.8703	54.8703	54.8703	54.8703	54.8703	54.8703	54.8703	54.8703	54.8703	54.8703	54.8703	54.8703	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-113.5447	-113.5447	-113.5447	-113.5447	-113.5447	-113.5447	-113.5447	-113.5447	-113.5447	-113.5447	-113.5447	-113.5447	(71)
Water heating gains (Table 5)													
	147.0022	144.3263	137.6710	120.3710	107.1980	99.7151	95.2729	99.9438	111.2508	123.7787	136.1089	145.5578	(72)
Total internal gains													
	714.6814	711.6557	687.2642	639.5939	591.5543	554.0509	532.4783	537.4990	566.5423	609.4405	656.6373	696.1067	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	4.9800	19.6403	0.3000	0.0000	0.7700	22.5938	(76)
West	3.5300	19.6403	0.3000	0.0000	0.7700	16.0153	(80)
Solar gains	38.6090	75.5274	124.3829	181.4051	222.3188	227.5828	216.6681	186.1147	144.6625	89.6197	48.1409	31.7502	(83)
Total gains	753.2904	787.1832	811.6472	820.9990	813.8730	781.6337	749.1464	723.6137	711.2048	699.0602	704.7782	727.8569	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	29.8506	30.0383	30.2283	31.2159	31.4212	32.4896	32.4896	32.7120	32.0536	31.4212	31.0132	30.6158	
alpha	2.9900	3.0026	3.0152	3.0811	3.0947	3.1660	3.1660	3.1808	3.1369	3.0947	3.0675	3.0411	
util living area													
	0.9246	0.9097	0.8797	0.8209	0.7277	0.5766	0.4398	0.4684	0.6542	0.8227	0.8995	0.9297	(86)
Living	19.2399	19.4273	19.7655	20.2275	20.5983	20.8690	20.9584	20.9489	20.7906	20.3379	19.7556	19.2427	
Non living	18.6683	18.8550	19.1888	19.6505	20.0019	20.2582	20.3275	20.3252	20.1873	19.7639	19.1946	18.6831	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.0996	19.4273	19.7655	20.2275	20.5983	20.8690	20.9584	20.9489	20.7906	20.3379	19.7556	19.4885	(87)
Th 2	20.2976	20.3017	20.3058	20.3264	20.3305	20.3512	20.3512	20.3553	20.3429	20.3305	20.3223	20.3140	(88)
util rest of house													
	0.9172	0.9008	0.8674	0.8020	0.6976	0.5310	0.3813	0.4105	0.6113	0.8007	0.8883	0.9228	(89)
MIT 2	19.4641	18.8550	19.1888	19.6505	20.0019	20.2582	20.3275	20.3252	20.1873	19.7639	19.1946	18.9113	(90)
Living area fraction										fLA = Living area / (4) =		0.2542	(91)
MIT	19.6257	19.0005	19.3354	19.7972	20.1535	20.4135	20.4879	20.4837	20.3407	19.9098	19.3372	19.0580	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6257	19.0005	19.3354	19.7972	20.1535	20.4135	20.4879	20.4837	20.3407	19.9098	19.3372	19.0580	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9092	0.8811	0.8477	0.7856	0.6891	0.5355	0.3940	0.4223	0.6111	0.7853	0.8694	0.9077	(94)
Useful gains	684.8584	693.5663	688.0099	644.9948	560.8330	418.5788	295.1334	305.5969	434.6343	548.9953	612.7207	660.6870	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1312.9877	1200.4729	1085.8980	892.7557	688.0344	457.6017	306.0310	319.2580	497.9083	757.7293	1009.0926	1241.1083	(97)
Space heating kWh	467.3282	340.6412	296.0288	178.3878	94.6378	0.0000	0.0000	0.0000	0.0000	155.2981	285.3878	431.8334	(98a)
Space heating requirement - total per year (kWh/year)												2249.5432	
Solar heating kWh	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	467.3282	340.6412	296.0288	178.3878	94.6378	0.0000	0.0000	0.0000	0.0000	155.2981	285.3878	431.8334	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2249.5432	
Space heating per m2											(98c) / (4) =	19.6707	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	277.7331	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	467.3282	340.6412	296.0288	178.3878	94.6378	0.0000	0.0000	0.0000	0.0000	155.2981	285.3878	431.8334	(98)
Space heating efficiency (main heating system 1)	277.7331	277.7331	277.7331	277.7331	277.7331	0.0000	0.0000	0.0000	0.0000	277.7331	277.7331	277.7331	(210)
Space heating fuel (main heating system)	168.2652	122.6506	106.5875	64.2299	34.0751	0.0000	0.0000	0.0000	0.0000	55.9163	102.7561	155.4850	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	272.3173	220.3441	190.6271	130.7846	92.3366	78.5588	75.3219	96.2253	131.5975	188.9437	238.6133	269.0854	(64)
Efficiency of water heater												279.7468	(216)
(217)m	279.7468	279.7468	279.7468	279.7468	279.7468	279.7468	279.7468	279.7468	279.7468	279.7468	279.7468	279.7468	(217)
Fuel for water heating, kWh/month	97.3442	78.7656	68.1427	46.7511	33.0072	28.0821	26.9250	34.3973	47.0416	67.5410	85.2962	96.1889	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	49.7582	44.9429	49.7582	48.1531	49.7582	48.1531	49.7582	49.7582	48.1531	49.7582	48.1531	49.7582	(231)
Lighting	36.4060	29.2062	26.2970	19.2663	14.8818	12.1586	13.5757	17.6462	22.9207	30.0732	33.9676	37.4178	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-38.1900	-56.9368	-85.9666	-100.0299	-109.1863	-99.9296	-98.7672	-92.1461	-80.2814	-66.1465	-42.7820	-32.5552	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-11.8965	-26.6432	-56.3797	-90.7421	-126.4964	-131.7841	-129.8844	-107.6278	-76.1817	-40.6993	-16.6278	-9.3587	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	809.9657	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	279.7468	
Water heating fuel used	709.4828	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.3580)		
mechanical ventilation fans (SFP = 1.3580)	505.8632	(230a)
pump for solar water heating	80.0000	(230g)
Total electricity for the above, kWh/year	585.8632	(231)
Electricity for lighting (calculated in Appendix L)	293.8171	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1727.2394	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	671.8894	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	809.9657	16.4900	133.5633	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	709.4828	16.4900	116.9937	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)

Pumps, fans and electric keep-hot	505.8632	16.4900	83.4168	(249)
Pump for solar water heating	80.0000	16.4900	13.1920	(249)
Energy for lighting	293.8171	16.4900	48.4504	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-902.9176	16.4900	-148.8911	
PV Unit electricity exported	-824.3218	5.5900	-46.0796	
Total			-194.9707	(252)
Total energy cost			200.6456	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.4533	(257)
SAP value		92.6526	
SAP rating (Section 12)		93	(258)
SAP band		A	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	809.9657	0.1550	125.5068	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	709.4828	0.1461	103.6320	(264)
Space and water heating			229.1388	(265)
Pumps, fans and electric keep-hot	585.8632	0.1387	81.2664	(267)
Energy for lighting	293.8171	0.1443	42.4069	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-902.9176	0.1341	-121.0365	
PV Unit electricity exported	-824.3218	0.1238	-102.0401	
Total			-223.0766	(269)
Total CO2, kg/year			129.7355	(272)
CO2 emissions per m2			1.1300	(273)
EI value			98.9091	
EI rating			99	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

Main dwelling	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	41.1800	(1b)	x 2.4800	(2b) =	102.1264	(1b) - (3b)
First floor	49.7800	(1c)	x 2.7800	(2c) =	138.3884	(1c) - (3c)
Second floor	23.4000	(1d)	x 2.7700	(2d) =	64.8180	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	114.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		305.3328	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.2500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2125	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.6000	4.5000	4.5000	4.1000	4.2000	3.7000	3.5000	3.5000	3.7000	4.1000	4.1000	4.2000	(22)
Wind factor	1.1500	1.1250	1.1250	1.0250	1.0500	0.9250	0.8750	0.8750	0.9250	1.0250	1.0250	1.0500	(22a)
Adj infilt rate	0.2444	0.2391	0.2391	0.2178	0.2231	0.1966	0.1859	0.1859	0.1966	0.2178	0.2178	0.2231	(22b)

Balanced mechanical ventilation with heat recovery		
If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	80.1000	(23c)

Effective ac	0.3439	0.3386	0.3386	0.3173	0.3226	0.2961	0.2854	0.2854	0.2961	0.3173	0.3173	0.3226 (25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Door			4.1400	1.0000	4.1400			(26)
Window			8.5100	0.7752	6.5969			(27)
GF			41.1800	0.0900	3.7062	75.0000	3088.5000	(28a)
Exposed Floor			8.6000	0.1400	1.2040	20.0000	172.0000	(28b)
Main	88.5000	12.6500	75.8500	0.1300	9.8605	9.0000	682.6500	(29a)
Dwarf Wall (PIRx0.72)	16.7700		16.7700	0.0900	1.5093	9.0000	150.9300	(29a)
PIJ	15.5100		15.5100	0.1300	2.0163	9.0000	139.5900	(30)
PIR	12.2300		12.2300	0.1300	1.5899	9.0000	110.0700	(30)
Residual Ceiling	26.3800		26.3800	0.0900	2.3742	9.0000	237.4200	(30)
Total net area of external elements Aum(A, m2)			209.1700					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		32.9973			(33)
Main dwelling								
Party Wall 1			88.2100	0.0000	0.0000	20.0000	1764.2000	(32)
Timber			124.1700			9.0000	1117.5300	(32c)
FF			41.1800			18.0000	741.2400	(32d)
SF			23.4000			18.0000	421.2000	(32d)
GF			41.1800			9.0000	370.6200	(32e)
FF			23.4000			9.0000	210.6000	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	9206.5500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		80.5050 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	8.6300	0.1150	0.9925
E3 Sill	8.6300	0.0170	0.1467
E4 Jamb	28.2000	0.0940	2.6508
E5 Ground floor (normal)	13.8200	0.0670	0.9259
E11 Eaves (insulation at rafter level)	18.1000	0.0250	0.4525
E16 Corner (normal)	16.0400	0.0680	1.0907
E12 Gable (insulation at ceiling level)	5.6600	0.0770	0.4358
E6 Intermediate floor within a dwelling	30.5000	0.0320	0.9760
E17 Corner (inverted - internal area greater than external area)	2.4800	-0.0290	-0.0719
P1 Party wall - Ground floor	15.2800	0.3200	4.8896
E20 Exposed floor (normal)	6.4400	0.0790	0.5088
E21 Exposed floor (inverted)	12.0800	0.0630	0.7610
E13 Gable (insulation at rafter level)	8.2800	0.0740	0.6127
E18 Party wall between dwellings	16.0800	0.0920	1.4794
R6 Flat ceiling	18.1000	-0.0430	-0.7783
E25 Staggered party wall between dwellings	4.9600	0.0560	0.2778

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		15.3500 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	48.3473 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	34.6488	34.1135	34.1135	31.9724	32.5076	29.8312	28.7606	28.7606	29.8312	31.9724	31.9724	32.5076	(38)
Heat transfer coeff	82.9960	82.4608	82.4608	80.3196	80.8549	78.1785	77.1079	77.1079	78.1785	80.3196	80.3196	80.8549	(39)
Average = Sum(39)m / 12 =												80.0966	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7257	0.7211	0.7211	0.7023	0.7070	0.6836	0.6743	0.6743	0.6836	0.7023	0.7023	0.7070	(40)
HLP (average)												0.7004	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.8386 (42)

Hot water usage for mixer showers

	71.8141	70.7349	69.1622	66.1532	63.9327	61.4564	60.0488	61.6096	63.3204	65.9793	69.0529	71.5389 (42a)

Hot water usage for baths

	31.0056	30.5451	29.8967	28.7011	27.8058	26.8131	26.2769	26.9208	27.6219	28.6841	29.9044	30.9008 (42b)

Hot water usage for other uses

	43.7003	42.1112	40.5221	38.9330	37.3439	35.7548	35.7548	37.3439	38.9330	40.5221	42.1112	43.7003 (42c)

Average daily hot water use (litres/day)	134.6848 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	146.5200	143.3912	139.5810	133.7873	129.0824	124.0242	122.0805	125.8742	129.8753	135.1855	141.0684	146.1400	(44)
Energy conte	232.0518	204.1871	214.5308	183.1481	173.7697	152.5023	147.6458	155.8586	160.1492	183.4454	200.9778	228.8199	(45)
Energy content (annual)										Total = Sum(45)m =		2237.0865	

Distribution loss (46)m = 0.15 x (45)m

	34.8078	30.6281	32.1796	27.4722	26.0655	22.8753	22.1469	23.3788	24.0224	27.5168	30.1467	34.3230 (46)

Water storage loss:	
Store volume	210.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):	1.5800 (48)
Temperature factor from Table 2b	0.5400 (49)
Enter (49) or (54) in (55)	0.8532 (55)

Total storage loss

	26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492 (56)

If cylinder contains dedicated solar storage

	17.0031	15.3576	17.0031	16.4546	17.0031	16.4546	17.0031	17.0031	16.4546	17.0031	16.4546	17.0031 (57)
Primary loss	23.2624	21.0112	21.8667	15.7584	10.4681	9.9053	10.2355	11.1660	17.1091	21.8667	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)

Total heat required for water heating calculated for each month

	272.3173	240.5559	253.4005	215.3611	201.2408	178.8621	174.8843	184.0276	193.7129	222.3151	239.9444	269.0854 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)

Aperture area of solar collector	3.0000 (H1)
Zero-loss collector efficiency	0.8000 (H2)
Collector linear heat loss coefficient	1.8000 (H3)
Collector 2nd order heat loss coefficient	0.0000 (H4)
Collector loop efficiency	0.9000 (H5)
Incidence angle modifier	1.0000 (H6)
Overshading factor	0.8000 (H8)
Overall heat loss coefficient of system	6.5000 (H10)
Heat loss coefficient of collector loop	3.9667 (H11)
Dedicated solar storage volume	75.0000 (H12)

If combined cylinder, total volume of cylinder												210.0000	(H13)
Effective solar volume												115.5000	(H14)
Reference volume												225.0000	(H15)
Storage tank correction coefficient												1.1814	(H16)
Heat delivered to hot water												604.6292	(H24)
Heat delivered to space heating												0.0000	(H29)
Solar input												604.6292	
Solar input	-0.0000	-14.4760	-57.1007	-79.9757	-101.4059	-95.2257	-92.0010	-79.0792	-57.3329	-28.0321	-0.0000	-0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	272.3173	226.0799	196.2998	135.3854	99.8349	83.6364	82.8832	104.9484	136.3800	194.2830	239.9444	269.0854	(64)
										Total per year (kWh/year) = Sum(64)m =		2041.0782	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	109.3696	96.9873	102.4273	86.6671	79.7553	71.7949	70.8830	74.3582	80.1006	92.0914	97.9984	108.2950	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	170.3170	170.3170	170.3170	170.3170	170.3170	170.3170	170.3170	170.3170	170.3170	170.3170	170.3170	170.3170	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	41.5929	36.9424	30.0436	22.7449	17.0021	14.3539	15.5099	20.1603	27.0592	34.3578	40.1006	42.7488	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	414.4438	418.7444	407.9069	384.8353	355.7115	328.3392	310.0529	305.7522	316.5897	339.6613	368.7851	396.1574	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	54.8703	54.8703	54.8703	54.8703	54.8703	54.8703	54.8703	54.8703	54.8703	54.8703	54.8703	54.8703	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-113.5447	-113.5447	-113.5447	-113.5447	-113.5447	-113.5447	-113.5447	-113.5447	-113.5447	-113.5447	-113.5447	-113.5447	(71)
Water heating gains (Table 5)													
	147.0022	144.3263	137.6710	120.3710	107.1980	99.7151	95.2729	99.9438	111.2508	123.7787	136.1089	145.5578	(72)
Total internal gains													
	714.6814	711.6557	687.2642	639.5939	591.5543	554.0509	532.4783	537.4990	566.5423	609.4405	656.6373	696.1067	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	4.9800	16.6187	0.3000	0.0000	0.7700	19.1178	(76)
West	3.5300	16.6187	0.3000	0.0000	0.7700	13.5514	(80)

Solar gains	32.6692	67.1355	116.6090	172.9395	207.2659	216.2037	201.7650	170.7039	137.1149	82.8303	42.3057	28.7264	(83)
Total gains	747.3506	778.7912	803.8732	812.5334	798.8202	770.2546	734.2433	708.2030	703.6572	692.2708	698.9429	724.8330	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	30.8132	31.0132	31.0132	31.8400	31.6292	32.7120	33.1662	33.1662	32.7120	31.8400	31.8400	31.6292	
alpha	3.0542	3.0675	3.0675	3.1227	3.1086	3.1808	3.2111	3.2111	3.1808	3.1227	3.1227	3.1086	
util living area													
	0.9197	0.9041	0.8755	0.8094	0.7066	0.5527	0.4404	0.4634	0.6521	0.8170	0.8922	0.9243	(86)
Living	19.3870	19.5655	19.8453	20.3088	20.6601	20.8929	20.9605	20.9532	20.8007	20.3783	19.8709	19.3958	
Non living	18.8280	19.0057	19.2788	19.7378	20.0620	20.2816	20.3410	20.3363	20.2070	19.8089	19.3194	18.8489	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.1749	19.5655	19.8453	20.3088	20.6601	20.8929	20.9605	20.9532	20.8007	20.3783	19.8709	19.6202	(87)
Th 2	20.3181	20.3223	20.3223	20.3388	20.3346	20.3553	20.3636	20.3636	20.3553	20.3388	20.3388	20.3346	(88)
util rest of house													
	0.9118	0.8946	0.8630	0.7894	0.6737	0.5048	0.3829	0.4051	0.6097	0.7944	0.8802	0.9169	(89)
MIT 2	19.5558	19.0057	19.2788	19.7378	20.0620	20.2816	20.3410	20.3363	20.2070	19.8089	19.3194	19.0567	(90)
Living area fraction										fLA = Living area / (4) =		0.2542	(91)
MIT	19.7132	19.1480	19.4228	19.8830	20.2140	20.4370	20.4985	20.4931	20.3579	19.9536	19.4596	19.2000	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7132	19.1480	19.4228	19.8830	20.2140	20.4370	20.4985	20.4931	20.3579	19.9536	19.4596	19.2000	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9039	0.8754	0.8438	0.7742	0.6673	0.5111	0.3953	0.4173	0.6099	0.7797	0.8618	0.9021	(94)
Useful gains	675.5394	681.7845	678.3447	629.0944	533.0770	393.6936	290.2751	295.5357	429.1720	539.7814	602.3789	653.8380	(95)
Ext temp.	4.7000	5.3000	6.7000	9.3000	12.3000	15.0000	16.6000	16.5000	14.1000	10.8000	7.5000	4.6000	(96)
Heat loss rate W													
	1246.0364	1141.9161	1049.1332	850.0195	639.8892	425.0552	300.6055	307.9028	489.2348	735.2146	960.5880	1180.4778	(97)
Space heating kWh													
	424.4498	309.2085	275.8666	159.0660	79.4683	0.0000	0.0000	0.0000	0.0000	145.4023	257.9105	391.8200	(98a)
Space heating requirement - total per year (kWh/year)												2043.1920	
Solar heating kWh													
	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	424.4498	309.2085	275.8666	159.0660	79.4683	0.0000	0.0000	0.0000	0.0000	145.4023	257.9105	391.8200	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2043.1920	
Space heating per m2											(98c) / (4) =	17.8663	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												276.7856	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	424.4498	309.2085	275.8666	159.0660	79.4683	0.0000	0.0000	0.0000	0.0000	145.4023	257.9105	391.8200	(98)
Space heating efficiency (main heating system 1)													
	276.7856	276.7856	276.7856	276.7856	276.7856	0.0000	0.0000	0.0000	0.0000	276.7856	276.7856	276.7856	(210)
Space heating fuel (main heating system)													
	153.3497	111.7141	99.6680	57.4691	28.7111	0.0000	0.0000	0.0000	0.0000	52.5325	93.1806	141.5608	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	272.3173	226.0799	196.2998	135.3854	99.8349	83.6364	82.8832	104.9484	136.3800	194.2830	239.9444	269.0854	(64)
Efficiency of water heater												279.7563	(216)
(217)m	279.7563	279.7563	279.7563	279.7563	279.7563	279.7563	279.7563	279.7563	279.7563	279.7563	279.7563	279.7563	(217)
Fuel for water heating, kWh/month													
	97.3409	80.8132	70.1681	48.3941	35.6864	29.8962	29.6269	37.5142	48.7496	69.4472	85.7691	96.1856	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	49.7582	44.9429	49.7582	48.1531	49.7582	48.1531	49.7582	49.7582	48.1531	49.7582	48.1531	49.7582	(231)
Lighting	36.4060	29.2062	26.2970	19.2663	14.8818	12.1586	13.5757	17.6462	22.9207	30.0732	33.9676	37.4178	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-32.9458	-51.6084	-81.7476	-96.5195	-104.3298	-97.2357	-95.0871	-87.6845	-77.5970	-62.2574	-38.2931	-29.7487	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-9.4351	-22.6849	-51.7021	-85.3499	-115.3953	-122.8923	-117.8371	-95.5477	-70.7028	-36.4941	-13.9155	-8.1733	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												738.1859	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												279.7563	
Water heating fuel used												729.5915	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.3580)													
mechanical ventilation fans (SFP = 1.3580)												505.8632	(230a)
pump for solar water heating												80.0000	(230g)
Total electricity for the above, kWh/year												585.8632	(231)
Electricity for lighting (calculated in Appendix L)												293.8171	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1605.1846	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												742.2731	(238)

10a. Fuel costs - using BEDF prices (583)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	738.1859	28.4300	209.8662	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	729.5915	28.4300	207.4229	(247)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(247a)
Pumps, fans and electric keep-hot	505.8632	28.4300	143.8169	(249)
Pump for solar water heating	80.0000	28.4300	22.7440	(249)
Energy for lighting	293.8171	28.4300	83.5322	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-855.0545	28.4300	-243.0920	
PV Unit electricity exported	-750.1301	5.8100	-43.5826	
Total			-286.6745	(252)
Total energy cost			380.7077	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	738.1859	0.1550	114.4165	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	729.5915	0.1456	106.2627	(264)
Space and water heating			220.6792	(265)
Pumps, fans and electric keep-hot	585.8632	0.1387	81.2664	(267)
Energy for lighting	293.8171	0.1443	42.4069	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-855.0545	0.1337	-114.3175	

PV Unit electricity exported	-750.1301	0.1236	-92.6807	
Total			-206.9981	(269)
Total CO2, kg/year			137.3544	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	738.1859	1.5738	1161.7751	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	729.5915	1.5388	1122.6665	(278)
Space and water heating			2284.4416	(279)
Pumps, fans and electric keep-hot	585.8632	1.5128	886.2938	(281)
Energy for lighting	293.8171	1.5338	450.6665	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-855.0545	1.4941	-1277.5231	
PV Unit electricity exported	-750.1301	0.4535	-340.1469	
Total			-1617.6700	(283)
Total Primary energy kWh/year			2003.7318	(286)

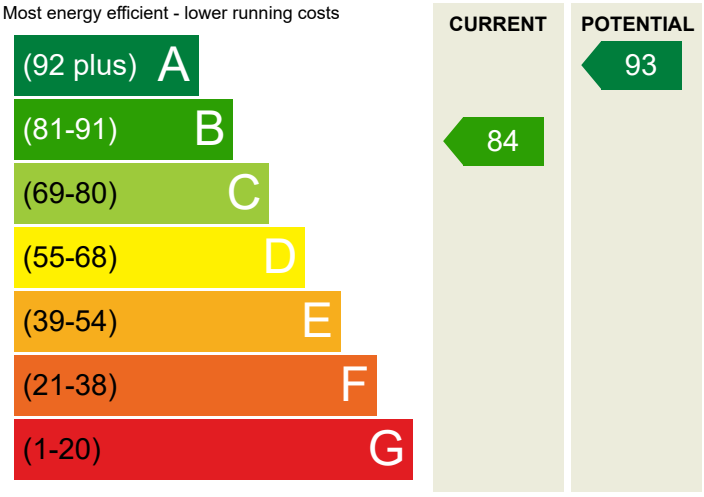
Energy Report

Dwelling Address	824 Rochdale Road, MANCHESTER, M9 8FA
Reference	78449-16-001
Assessment Date	02/07/2025
Submission Date	
Property Type	House, Mid-Terrace
Total Floor Area	114

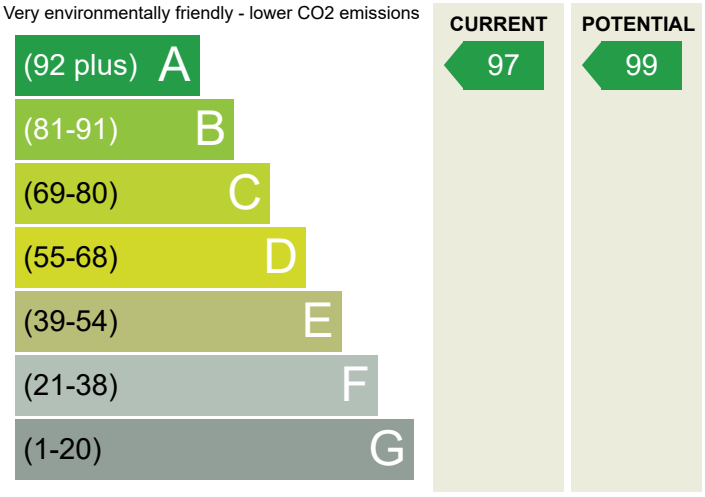
This Energy Report has been generated using the UK's National Calculation Methodology for dwellings, Standard Assessment Procedure (SAP). This methodology is used to assess the energy efficiency of dwellings which is calculated based on a dwelling's heating, hot water, ventilation and lighting usage.

This document is not an Energy Performance Certificate (EPC) as required by the Energy Performance of Buildings Regulations

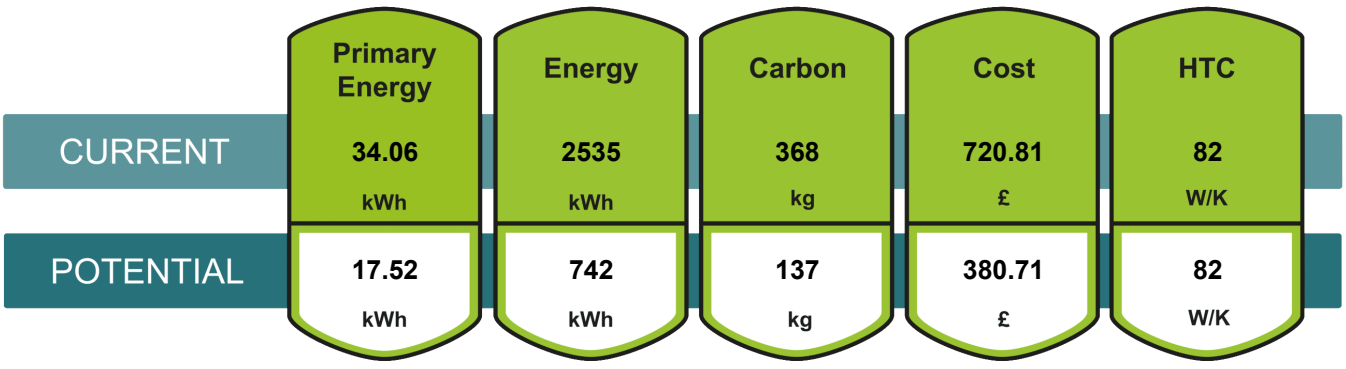
Energy Efficiency Rating



Carbon Dioxide (CO2) Emissions Rating



Additional ratings for your home



Energy Report

Breakdown of property's energy performance

Each feature is assessed as one of the following:

Very Poor | Poor | Average | Good | Very Good

Feature	Description	Energy Performance
Walls	Average thermal transmittance 0.12 W/m²K	Very Good
Roof	Average thermal transmittance 0.11 W/m²K	Very Good
Floor	Average thermal transmittance 0.1 W/m²K	Very Good
Windows	High performance glazing	Very Good
Main heating	Air source heat pump, radiators, electric	Good
Main heating controls	Programmer, room thermostat and TRVs	Good
Secondary heating	None	
Hot water	From main system	Good
Lighting	Good lighting efficiency	Good
Air tightness	Air permeability [AP50] = 5.0 m³/h.m² (as tested)	Good

Recommendations

The recommended measures provided below will help to improve the energy efficiency of the dwelling.
To reach the dwelling's potential energy rating all of the recommended measures shown below would need to be installed.
Having these measures installed individually or in any other order may give a different result when compared with the cumulative potential rating.

Recommended measures	Cumulative savings (per year)	Cumulative rating	Typical costs	Incremental savings (per year)	Cumulative CO2 rating
Solar water heating	£53	B 86	£4,000 - £7,000	£53	A 97
Photovoltaic	£340	A 93	£8,000 - £10,000	£287	A 99

Energy Report

The typical cost is based on average installation prices across the country so may not be representative of the actual costs in your area.

Estimated energy costs of the dwelling

The table below shows the estimated running costs of the space and water heating and lighting within the dwelling. It does not include the energy used from household appliances. The estimated annual costs after potential improvements indicates the total energy cost if all recommended measures named above were installed.

	Estimated annual costs	Estimated annual costs after potential improvements	Potential future savings
Lighting	£84	£84	
Heating	£350	£376	
Hot Water	£287	£207	
New Technologies e.g. Impact of PV	£0	-(£287)	
TOTAL	£721	£381	

Estimated energy use and potential savings

Space Heating
727
kWh per year

Water Heating
1009
kWh per year

Energy Report

About this document

Created by:	
Company/Trading name:	
Phone number:	
Email address:	

Disclaimer

This Energy Report should not under any circumstances be treated as a Condition Survey and cannot be used to indicate that any element of the dwelling (e.g.heating system) is working correctly.
This Energy Report must not be used in situations where an Energy Performance Certificate (EPC) is required.
This Energy Report is generated from a set of data inputs which may not reflect the actual dimensions, services or construction of the dwelling.
The calculation used to generate this report reflects the SAP Methodology current at the time of report generation.

Glossary terms for additional metrics

Primary Energy	The measure of the energy required for lighting, heating and hot water in a property. This includes the efficiency of the property's heating system, power station efficiency for electricity and the energy used to produce the fuel and deliver it to the property.
Energy Used	The estimated amount of fuel energy for lighting, heating and hot water for the property. The estimate is based on typical usage which is likely to be different to actual consumption.
Carbon (CO2)	The current emissions based on the energy estimates.
Cost	The estimated cost of energy. The cost of each unit of fuel is based on an industry standard which is likely to be different to those the occupier actually pays.
Heat Transfer Coefficient	Heat flow through the property envelope where internal and external temperatures are different.

Building Regulations England Part L (BREL) Compliance Report

Approved Document L1 2021 Edition, England assessed by Array SAP 10 program, Array

Date: Fri 03 Oct 2025 15:03:29

Project Information			
Assessed By	Paul Goddard	Building Type	House, Mid-terrace
OCDEA Registration	EES/005113	Assessment Date	2025-10-03

Dwelling Details			
Assessment Type	As built	Total Floor Area	91 m^2
Site Reference	78449-17	Plot Reference	001
Address	822 Rochdale Road, MANCHESTER, M9 8FA		

Client Details	
Name	-
Company	John Southworth
Address	Unit 10, Charles Street, DUKINFIELD, SK16 4SD

This report covers items included within the SAP calculations. It is not a complete report of regulations compliance.

1a Target emission rate and dwelling emission rate		
Fuel for main heating system	Electricity	
Target carbon dioxide emission rate	*11.44 $kgCO_2/m^2$*	
Dwelling carbon dioxide emission rate	3.62 $kgCO_2/m^2$	**OK**
1b Target primary energy rate and dwelling primary energy		
Target primary energy	*59.93 kWh_{PE}/m^2*	
Dwelling primary energy	38.33 kWh_{PE}/m^2	**OK**
1c Target fabric energy efficiency and dwelling fabric energy efficiency		
Target fabric energy efficiency	*36.9 kWh/m^2*	
Dwelling fabric energy efficiency	34.1 kWh/m^2	**OK**

2a Fabric U-values				
Element	***Maximum permitted average U-Value [W/m^2K]***	**Dwelling average U-Value [W/m^2K]**	**Element with highest individual U-Value**	
External walls	*0.26*	0.13	Walls (1) (0.13)	**OK**
Party walls	*0.2*	0	Party Wall (1) (0)	**N/A**
Curtain walls	*1.6*	0	N/A	**N/A**
Floors	*0.18*	0.09	Exposed Floor (0.14)	**OK**
Roofs	*0.16*	0.13	Roof (1) (0.13)	**OK**
Windows, doors, and roof windows	*1.6*	0.87	Front (1)	**OK**
Rooflights	*2.2*	N/A	N/A	**N/A**

2b Envelope elements (better than typically expected values are flagged with a subsequent (!))		
Name	**Net area [m^2]**	**U-Value [W/m^2K]**
Exposed wall: Walls (1)	52.2	0.13 **(!)**
Party wall: Party Wall (1)	88.21	0 **(!)**
Ground floor: GF, GF	41.18	0.08 **(!)**
Upper floor: Exposed Floor, Exposed Floor	8.6	0.14
Exposed roof: Roof (1)	49.779998779296875	0.13

2c Openings (better than typically expected values are flagged with a subsequent (!))				
Name	**Area [m^2]**	**Orientation**	**Frame factor**	**U-Value [W/m^2K]**
Front, Door	1.99	East	N/A	1 **(!)**
Front, Window	4.98	East	1.0	0.8 **(!)**
Rear, Window	3.53	West	1.0	0.8 **(!)**
Rear, Door	2.15	West	N/A	1 **(!)**

2d Thermal bridging (better than typically expected values are flagged with a subsequent (!))				
Building part **1**: Thermal bridging calculated from linear thermal transmittances for each junction				
Main element	**Junction detail**	**Source**	**Psi value [W/mK]**	**Drawing / reference**
External wall	E2: Other lintels (including other steel lintels)	Calculated by person with suitable expertise	0.115	Thermal Bridge Report

Main element	Junction detail	Source	Psi value [W/mK]	Drawing / reference
External wall	E3: Sill	Calculated by person with suitable expertise	0.017 **(!)**	Thermal Bridge Report
External wall	E4: Jamb	Calculated by person with suitable expertise	0.094	Thermal Bridge Report
External wall	E5: Ground floor (normal)	Calculated by person with suitable expertise	0.067	Thermal Bridge Report
External wall	E16: Corner (normal)	Calculated by person with suitable expertise	0.068	Thermal Bridge Report
External wall	E12: Gable (insulation at ceiling level)	Calculated by person with suitable expertise	0.077	Thermal Bridge Report
External wall	E6: Intermediate floor within a dwelling	Calculated by person with suitable expertise	0.032 **(!)**	Thermal Bridge Report
External wall	E17: Corner (inverted - internal area greater than external area)	Calculated by person with suitable expertise	-0.029 **(!)**	Thermal Bridge Report
Party wall	P1: Ground floor	SAP table default	0.32	K1
External wall	E20: Exposed floor (normal)	Calculated by person with suitable expertise	0.079	Thermal Bridge Report
External wall	E21: Exposed floor (inverted)	Calculated by person with suitable expertise	0.063	Thermal Bridge Report
External wall	E18: Party wall between dwellings	Calculated by person with suitable expertise	0.092	Thermal Bridge Report
Party wall	P4: Roof (insulation at ceiling level)	Calculated by person with suitable expertise	0.102	Thermal Bridge Report

3 Air permeability (better than typically expected values are flagged with a subsequent (!))		
Maximum permitted air permeability at 50Pa	*8 m^3/hm^2*	
Dwelling air permeability at 50Pa	5 m^3/hm^2, Measured value	OK
Air permeability test certificate reference		

4 Space heating	
Main heating system 1: Heat pump with radiators or underfloor heating - Electricity	
Efficiency	270.7%
Emitter type	Radiators
Flow temperature	45°C
System type	
Manufacturer	Daikin Europe NV
Model	EDLA09DA3V3
Commissioning	
Secondary heating system: N/A	
Fuel	N/A
Efficiency	N/A
Commissioning	

5 Hot water	
Cylinder/store - type: Cylinder	
Capacity	210 litres
Declared heat loss	1.58 kWh/day
Primary pipework insulated	Yes
Manufacturer	
Model	
Commissioning	
Waste water heat recovery system 1 - type: N/A	
Efficiency	
Manufacturer	
Model	

6 Controls	
Main heating 1 - type: Programmer, room thermostat and TRVs	
Function	
Ecodesign class	
Manufacturer	
Model	

Water heating - type: Cylinder thermostat and HW separately timed	
Manufacturer	
Model	

7 Lighting		
Minimum permitted light source efficacy	*75 lm/W*	
Lowest light source efficacy	80 lm/W	OK
External lights control	N/A	

8 Mechanical ventilation		
System type: Balanced whole-house mechanical ventilation with heat recovery		
Maximum permitted specific fan power	*1.5 W/(l/s)*	
Specific fan power	0.85 W/(l/s)	OK
Minimum permitted heat recovery efficiency	*73%*	
Heat recovery efficiency	90%	OK
Manufacturer/Model	DV110 Adroit	
Commissioning		

9 Local generation
N/A

10 Heat networks
N/A

11 Supporting documentary evidence	
Documentary evidence identified in 11.1 and 11.2 is needed to confirm the data values used for any calculations undertaken, manufacturer declarations made, and tests performed as reflected in this "As built" BREL Compliance Report are correct. 11.1 SAP Conventions, Appendix 1 (documentary evidence) schedules the minimum documentary evidence required. 11.2 Indicative photographic evidence of key stages during construction (guidance within Approved Document L, Volume 1 – Appendix B) that confirms the products identified in this BREL Compliance Report are used in this dwelling, and workmanship is of sufficient quality to support the calculated values claimed in 2a to 2d.	

12 Declarations	
a. Assessor Declaration	
This declaration by the assessor is confirmation that the contents of this BREL Compliance Report are a true and accurate reflection based upon the design and construction information submitted for this dwelling for the purpose of carrying out the assessment, and that the supporting documentary evidence (identified in 11.1 and 11.2) pursuant to Part L of the Building Regulations 2010 (as amended) has been reviewed in the course of preparing this BREL Compliance Report.	
Signed: Name:	Assessor ID: Date:
b. Client Declaration	
This declaration by the client is confirmation that the dwelling has been constructed and completed according to the specifications set out in this BREL Compliance Report, and that photographic evidence of key stages, as described in 11.2, has been provided to the Assessor for this dwelling.	
Signed: Name:	Organisation: Date:

Full SAP Calculation Printout

Property Reference	78449-17	**Issued on Date**	03/10/2025
Assessment Reference	001	**Prop Type Ref**	Mid
Property	822 Rochdale Road, MANCHESTER, M9 8FA		

SAP Rating	84 B	**DER**	3.62	**TER**	11.44
Environmental	97 A	**% DER < TER**			68.36
CO_2 Emissions (t/year)	0.32	**DFEE**	34.10	**TFEE**	36.90
Compliance Check	See BREL	**% DFEE < TFEE**			7.58
% DPER < TPER	36.04	**DPER**	38.33	**TPER**	59.93

Assessor Details	Mr. Daniel Goddard	**Assessor ID**	CP52-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	41.1800	(1b)	x 2.4800	(2b) =	102.1264	(1b) - (3b)
First floor	49.7800	(1c)	x 2.7800	(2c) =	138.3884	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	90.9600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		240.5148	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.2500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2125	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2709	0.2656	0.2603	0.2338	0.2284	0.2019	0.2019	0.1966	0.2125	0.2284	0.2391	0.2497	(22b)

Balanced mechanical ventilation with heat recovery		
If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =		81.0000 (23c)

Effective ac	0.3659	0.3606	0.3553	0.3287	0.3234	0.2969	0.2969	0.2916	0.3075	0.3234	0.3341	0.3447	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door			4.1400	1.0000	4.1400			(26)
Window			8.5100	0.7752	6.5969			(27)
GF			41.1800	0.0800	3.2944	75.0000	3088.5000	(28a)
Exposed Floor			8.6000	0.1400	1.2040	20.0000	172.0000	(28b)
Main	64.8536	12.6500	52.2036	0.1300	6.7865	9.0000	469.8324	(29a)
PIJ	49.7800		49.7800	0.1300	6.4714	9.0000	448.0200	(30)
Total net area of external elements Aum(A, m2)			164.4136					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		28.4932			(33)
Main dwelling								
Party Wall 1			88.2100	0.0000	0.0000	20.0000	1764.2000	(32)
Timber			96.4800			9.0000	868.3200	(32c)
FF			41.1800			18.0000	741.2400	(32d)
GF			41.1800			9.0000	370.6200	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 7922.7324 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 87.1013 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	8.6300	0.1150	0.9925
E3 Sill	8.6300	0.0170	0.1467
E4 Jamb	28.2000	0.0940	2.6508
E5 Ground floor (normal)	13.8200	0.0670	0.9259
E16 Corner (normal)	4.9600	0.0680	0.3373
E12 Gable (insulation at ceiling level)	11.0000	0.0770	0.8470
E6 Intermediate floor within a dwelling	11.0000	0.0320	0.3520
E17 Corner (inverted - internal area greater than external area)	4.9600	-0.0290	-0.1438
P1 Party wall - Ground floor	15.2800	0.3200	4.8896
E20 Exposed floor (normal)	6.4400	0.0790	0.5088
E21 Exposed floor (inverted)	12.0800	0.0630	0.7610
E18 Party wall between dwellings	21.0400	0.0920	1.9357
P4 Party wall - Roof (insulation at ceiling level)	18.1000	0.1020	1.8462

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 16.0496 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 44.5428 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	29.0444	28.6228	28.2011	26.0928	25.6712	23.5629	23.5629	23.1413	24.4062	25.6712	26.5145	27.3578	(38)
Heat transfer coeff	73.5872	73.1656	72.7439	70.6356	70.2140	68.1057	68.1057	67.6841	68.9490	70.2140	71.0573	71.9006	(39)
Average = Sum(39)m / 12 =												70.5302	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8090	0.8044	0.7997	0.7766	0.7719	0.7487	0.7487	0.7441	0.7580	0.7719	0.7812	0.7905	(40)
HLP (average)												0.7754	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6386 (42)
Hot water usage for mixer showers

68.4610	67.4321	65.9329	63.0644	60.9476	58.5869	57.2450	58.7329	60.3639	62.8986	65.8287	68.1987	(42a)

Hot water usage for baths

29.5637	29.1246	28.5063	27.3663	26.5127	25.5661	25.0549	25.6688	26.3373	27.3502	28.5137	29.4637	(42b)

Hot water usage for other uses

41.6522	40.1376	38.6230	37.1084	35.5937	34.0791	34.0791	35.5937	37.1084	38.6230	40.1376	41.6522	(42c)

Average daily hot water use (litres/day) 128.3946 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	139.6769	136.6944	133.0622	127.5391	123.0540	118.2321	116.3790	119.9955	123.8096	128.8717	134.4799	139.3147	(44)
Energy conte	221.2141	194.6510	204.5117	174.5947	165.6543	145.3802	140.7503	148.5795	152.6696	174.8777	191.5913	218.1331	(45)
Energy content (annual)										Total = Sum(45)m =		2132.6075	

Distribution loss (46)m = 0.15 x (45)m

33.1821	29.1976	30.6768	26.1892	24.8482	21.8070	21.1126	22.2869	22.9004	26.2317	28.7387	32.7200	(46)

Water storage loss:
Store volume 210.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.5800 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.8532 (55)
Total storage loss

26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(56)

If cylinder contains dedicated solar storage

26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(57)
23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Primary loss
Combi loss
Total heat required for water heating calculated for each month

270.9257	239.5518	254.2233	222.7027	215.3659	193.4882	190.4619	198.2911	200.7776	224.5893	239.6993	267.8447	(62)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

WWHRS
PV diverter
Solar input
FGHRS
Output from w/h

270.9257	239.5518	254.2233	222.7027	215.3659	193.4882	190.4619	198.2911	200.7776	224.5893	239.6993	267.8447	(64)

Total per year (kWh/year) = Sum(64)m = 2717.9215 (64)
12Total per year (kWh/year) 2718 (64)
Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)
Heat gains from water heating, kWh/month

113.3230	100.6421	107.7694	96.5391	94.8493	86.8253	86.5688	89.1720	89.2490	97.9161	102.1905	112.2985	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	145.9975	161.6401	145.9975	150.8641	145.9975	150.8641	145.9975	145.9975	150.8641	145.9975	150.8641	145.9975	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	240.8328	243.3319	237.0343	223.6274	206.7036	190.7976	180.1714	177.6723	183.9699	197.3768	214.3007	230.2066	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	(71)
Water heating gains (Table 5)	152.3158	149.7650	144.8514	134.0821	127.4857	120.5907	116.3559	119.8548	123.9570	131.6077	141.9313	150.9389	(72)
Total internal gains	601.7256	617.3165	590.4626	571.1531	542.7662	524.8319	505.1042	506.1041	521.3705	537.5615	569.6755	589.7225	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a	g Specific data	FF Specific data	Access factor	Gains W

					W/m2	or Table 6b		or Table 6c		Table 6d			
East					4.9800	19.6403		0.3000	0.0000	0.7700		22.5938	(76)
West					3.5300	19.6403		0.3000	0.0000	0.7700		16.0153	(80)
Solar gains	38.6090	75.5274	124.3829	181.4051	222.3188	227.5828	216.6681	186.1147	144.6625	89.6197	48.1409	31.7502	(83)
Total gains	640.3346	692.8439	714.8456	752.5582	765.0850	752.4147	721.7724	692.2188	666.0330	627.1812	617.8164	621.4727	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	29.9068	30.0792	30.2535	31.1565	31.3436	32.3139	32.3139	32.5152	31.9186	31.3436	30.9716	30.6084	
alpha	2.9938	3.0053	3.0169	3.0771	3.0896	3.1543	3.1543	3.1677	3.1279	3.0896	3.0648	3.0406	
util living area	0.9265	0.9051	0.8739	0.8005	0.6927	0.5307	0.3996	0.4294	0.6194	0.8096	0.8956	0.9309	(86)
Living	19.2282	19.4614	19.7964	20.2867	20.6516	20.8954	20.9678	20.9595	20.8198	20.3698	19.7744	19.2315	
Non living	18.6144	18.8450	19.1745	19.6594	20.0000	20.2268	20.2808	20.2795	20.1607	19.7473	19.1690	18.6294	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.0936	19.4614	19.7964	20.2867	20.6516	20.8954	20.9678	20.9595	20.8198	20.3698	19.7744	19.4788	(87)
Th 2	20.2455	20.2495	20.2536	20.2737	20.2777	20.2980	20.2980	20.3020	20.2899	20.2777	20.2697	20.2616	(88)
util rest of house	0.9187	0.8951	0.8602	0.7788	0.6590	0.4827	0.3406	0.3702	0.5727	0.7849	0.8832	0.9236	(89)
MIT 2	19.4111	18.8450	19.1745	19.6594	20.0000	20.2268	20.2808	20.2795	20.1607	19.7473	19.1690	18.8577	(90)
Living area fraction										fLA = Living area / (4) =		0.3196	(91)
MIT	19.6292	19.0420	19.3732	19.8599	20.2082	20.4405	20.5004	20.4968	20.3713	19.9462	19.3625	19.0562	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6292	19.0420	19.3732	19.8599	20.2082	20.4405	20.5004	20.4968	20.3713	19.9462	19.3625	19.0562	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9114	0.8762	0.8417	0.7653	0.6556	0.4927	0.3579	0.3870	0.5783	0.7723	0.8653	0.9093	(94)
Useful gains	583.6055	607.0518	601.6955	575.9327	501.6028	370.7506	258.3504	267.9168	385.1931	484.3734	534.5741	565.0785	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1128.0364	1034.7055	936.4503	774.1591	597.3978	397.7702	265.6377	277.2882	432.4032	656.2346	871.3380	1068.1696	(97)
Space heating kWh	405.0565	287.3833	249.0575	142.7230	71.2714	0.0000	0.0000	0.0000	0.0000	127.8647	242.4700	374.2997	(98a)
Space heating requirement - total per year (kWh/year)												1900.1263	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	405.0565	287.3833	249.0575	142.7230	71.2714	0.0000	0.0000	0.0000	0.0000	127.8647	242.4700	374.2997	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1900.1263	
Space heating per m2											(98c) / (4) =	20.8897	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												270.7081	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	405.0565	287.3833	249.0575	142.7230	71.2714	0.0000	0.0000	0.0000	0.0000	127.8647	242.4700	374.2997	(98)
Space heating efficiency (main heating system 1)	270.7081	270.7081	270.7081	270.7081	270.7081	0.0000	0.0000	0.0000	0.0000	270.7081	270.7081	270.7081	(210)
Space heating fuel (main heating system)	149.6285	106.1598	92.0022	52.7221	26.3278	0.0000	0.0000	0.0000	0.0000	47.2334	89.5688	138.2669	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	270.9257	239.5518	254.2233	222.7027	215.3659	193.4882	190.4619	198.2911	200.7776	224.5893	239.6993	267.8447	(64)
Efficiency of water heater												281.1060	(216)
(217)m	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	(217)
Fuel for water heating, kWh/month	96.3785	85.2176	90.4368	79.2237	76.6138	68.8310	67.7545	70.5396	71.4242	79.8949	85.2701	95.2824	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	29.6563	26.7864	29.6563	28.6997	29.6563	28.6997	29.6563	29.6563	28.6997	29.6563	28.6997	29.6563	(231)
Lighting	30.8703	24.7653	22.2984	16.3368	12.6190	10.3098	11.5115	14.9631	19.4355	25.5005	28.8027	31.7283	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	701.9096	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	281.1060	
Water heating fuel used	966.8671	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.1900)		
mechanical ventilation fans (SFP = 1.1900)	349.1794	(230a)
Total electricity for the above, kWh/year	349.1794	(231)
Electricity for lighting (calculated in Appendix L)	249.1413	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2267.0974	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	701.9096	0.1552	108.9520	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	966.8671	0.1410	136.2905	(264)
Space and water heating			245.2426	(265)
Pumps, fans and electric keep-hot	349.1794	0.1387	48.4355	(267)
Energy for lighting	249.1413	0.1443	35.9588	(268)
Total CO2, kg/year			329.6368	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.6200	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	701.9096	1.5746	1105.2587	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	966.8671	1.5212	1470.8230	(278)
Space and water heating			2576.0817	(279)
Pumps, fans and electric keep-hot	349.1794	1.5128	528.2386	(281)
Energy for lighting	249.1413	1.5338	382.1413	(282)
Total Primary energy kWh/year			3486.4616	(286)
Dwelling Primary energy Rate (DPER)			38.3300	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	41.1800	(1b)	x 2.4800	(2b) =	102.1264	(1b) - (3b)
First floor	49.7800	(1c)	x 2.7800	(2c) =	138.3884	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	90.9600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		240.5148	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1247	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3747	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3185	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)

Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4061	0.3982	0.3902	0.3504	0.3424	0.3026	0.3026	0.2946	0.3185	0.3424	0.3583	0.3743 (22b)
Effective ac	0.5825	0.5793	0.5761	0.5614	0.5586	0.5458	0.5458	0.5434	0.5507	0.5586	0.5642	0.5700 (25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			4.1400	1.0000	4.1400			(26)
TER Opening Type			8.5100	1.1450	9.7443			(27)
GF			41.1800	0.1300	5.3534			(28a)
Exposed Floor			8.6000	0.1300	1.1180			(28b)
Main	64.8536	12.6500	52.2036	0.1800	9.3966			(29a)
PIJ	49.7800		49.7800	0.1100	5.4758			(30)
Total net area of external elements Aum(A, m2)			164.4136					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	35.2281			(33)
Main dwelling								
Party Wall 1			88.2100	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	87.1013	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	8.6300	0.0500	0.4315
E3 Sill	8.6300	0.0500	0.4315
E4 Jamb	28.2000	0.0500	1.4100
E5 Ground floor (normal)	13.8200	0.1600	2.2112
E16 Corner (normal)	4.9600	0.0900	0.4464
E12 Gable (insulation at ceiling level)	11.0000	0.0600	0.6600
E6 Intermediate floor within a dwelling	11.0000	0.0000	0.0000
E17 Corner (inverted - internal area greater than external area)	4.9600	-0.0900	-0.4464
P1 Party wall - Ground floor	15.2800	0.0800	1.2224
E20 Exposed floor (normal)	6.4400	0.3200	2.0608
E21 Exposed floor (inverted)	12.0800	0.3200	3.8656
E18 Party wall between dwellings	21.0400	0.0600	1.2624
P4 Party wall - Roof (insulation at ceiling level)	18.1000	0.1200	2.1720

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		15.7274	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	50.9555	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	46.2302	45.9760	45.7269	44.5568	44.3378	43.3187	43.3187	43.1299	43.7112	44.3378	44.7807	45.2438	(38)
Heat transfer coeff	97.1857	96.9316	96.6824	95.5123	95.2934	94.2742	94.2742	94.0855	94.6668	95.2934	95.7363	96.1993	(39)
Average = Sum(39)m / 12 =												95.5112	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0684	1.0657	1.0629	1.0500	1.0476	1.0364	1.0364	1.0344	1.0408	1.0476	1.0525	1.0576	(40)
HLP (average)												1.0500	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy											2.6386	(42)
Hot water usage for mixer showers	68.4610	67.4321	65.9329	63.0644	60.9476	58.5869	57.2450	58.7329	60.3639	62.8986	65.8287	68.1987 (42a)
Hot water usage for baths	29.5637	29.1246	28.5063	27.3663	26.5127	25.5661	25.0549	25.6688	26.3373	27.3502	28.5137	29.4637 (42b)
Hot water usage for other uses	41.6522	40.1376	38.6230	37.1084	35.5937	34.0791	34.0791	35.5937	37.1084	38.6230	40.1376	41.6522 (42c)
Average daily hot water use (litres/day)												128.3946 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	139.6769	136.6944	133.0622	127.5391	123.0540	118.2321	116.3790	119.9955	123.8096	128.8717	134.4799	139.3147	(44)
Energy conte	221.2141	194.6510	204.5117	174.5947	165.6543	145.3802	140.7503	148.5795	152.6696	174.8777	191.5913	218.1331	(45)
Energy content (annual)										Total = Sum(45)m =		2132.6075	
Distribution loss (46)m = 0.15 x (45)m	33.1821	29.1976	30.6768	26.1892	24.8482	21.8070	21.1126	22.2869	22.9004	26.2317	28.7387	32.7200	(46)
Water storage loss:													
Store volume												210.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7016	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.9188	(55)
Total storage loss	28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842	(56)
If cylinder contains dedicated solar storage	28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	272.9607	241.3898	256.2583	224.6720	217.4009	195.4575	192.4969	200.3261	202.7469	226.6243	241.6687	269.8797	(62)
WWHRS	-31.2975	-27.6798	-28.9847	-24.0004	-22.3675	-19.1401	-17.9408	-19.0782	-19.8031	-23.3456	-26.4477	-30.7179	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	241.6632	213.7101	227.2737	200.6716	195.0334	176.3175	174.5562	181.2479	182.9439	203.2787	215.2209	239.1618	(64)
										Total per year (kWh/year) = Sum(64)m =		2451.0786	(64)
12Total per year (kWh/year)												2451	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	114.9510	102.1125	109.3974	98.1146	96.4773	88.4008	88.1968	90.7999	90.8245	99.5441	103.7660	113.9265	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

(66)m	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	142.2156	157.4530	142.2156	146.9561	142.2156	146.9561	142.2156	142.2156	146.9561	142.2156	146.9561	142.2156	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	240.8328	243.3319	237.0343	223.6274	206.7036	190.7976	180.1714	177.6723	183.9699	197.3768	214.3007	230.2066	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	(71)
Water heating gains (Table 5)													
	154.5040	151.9532	147.0395	136.2703	129.6738	122.7789	118.5440	122.0429	126.1452	133.7959	144.1194	153.1270	(72)
Total internal gains													
	603.1319	618.3176	591.8689	572.4333	544.1725	523.1121	503.5105	504.5103	519.6507	538.9678	570.9557	591.1288	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	4.9800	19.6403	0.6300	0.7000	0.7700	29.8916	(76)
West	3.5300	19.6403	0.6300	0.7000	0.7700	21.1882	(80)

Solar gains	51.0797	99.9228	164.5586	239.9990	294.1277	301.0921	286.6519	246.2298	191.3885	118.5668	63.6904	42.0055	(83)
Total gains	654.2116	718.2404	756.4276	812.4323	838.3003	824.2042	790.1625	750.7401	711.0392	657.5346	634.6461	633.1343	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	22.6449	22.7043	22.7628	23.0416	23.0946	23.3442	23.3442	23.3911	23.2474	23.0946	22.9877	22.8771	
alpha	2.5097	2.5136	2.5175	2.5361	2.5396	2.5563	2.5563	2.5594	2.5498	2.5396	2.5325	2.5251	
util living area													
	0.9363	0.9179	0.8900	0.8294	0.7371	0.6002	0.4715	0.5071	0.6872	0.8450	0.9135	0.9408	(86)
MIT	18.4665	18.7376	19.1692	19.7832	20.3219	20.7241	20.8928	20.8676	20.5829	19.8994	19.1053	18.4305	(87)
Th 2	20.0267	20.0290	20.0312	20.0418	20.0438	20.0531	20.0531	20.0548	20.0495	20.0438	20.0398	20.0356	(88)
util rest of house													
	0.9284	0.9077	0.8757	0.8060	0.6983	0.5374	0.3858	0.4222	0.6306	0.8190	0.9010	0.9333	(89)
MIT 2	17.0633	17.4054	17.9489	18.7154	19.3635	19.8213	19.9856	19.9670	19.6760	18.8716	17.8806	17.0230	(90)
Living area fraction										fLA = Living area / (4) =		0.3196	(91)
MIT	17.5118	17.8312	18.3389	19.0566	19.6698	20.1098	20.2755	20.2548	19.9659	19.2001	18.2720	17.4728	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.5118	17.8312	18.3389	19.0566	19.6698	20.1098	20.2755	20.2548	19.9659	19.2001	18.2720	17.4728	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9004	0.8773	0.8442	0.7775	0.6812	0.5414	0.4069	0.4412	0.6251	0.7913	0.8712	0.9063	(94)
Useful gains	589.0216	630.1383	638.5494	631.6864	571.0784	446.2550	321.5222	331.1952	444.4610	520.3070	552.8988	573.8331	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1283.9967	1253.4418	1144.6149	970.0843	759.4665	519.4329	346.5070	362.6828	555.3014	819.5308	1069.5680	1276.8325	(97)
Space heating kWh													
	517.0614	418.8600	376.5127	243.6465	140.1607	0.0000	0.0000	0.0000	0.0000	222.6225	372.0018	523.0315	(98a)
Space heating requirement - total per year (kWh/year)												2813.8972	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	517.0614	418.8600	376.5127	243.6465	140.1607	0.0000	0.0000	0.0000	0.0000	222.6225	372.0018	523.0315	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2813.8972	
Space heating per m2											(98c) / (4) =	30.9355	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	517.0614	418.8600	376.5127	243.6465	140.1607	0.0000	0.0000	0.0000	0.0000	222.6225	372.0018	523.0315	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	560.1966	453.8028	407.9227	263.9724	151.8534	0.0000	0.0000	0.0000	0.0000	241.1945	403.0355	566.6647	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	241.6632	213.7101	227.2737	200.6716	195.0334	176.3175	174.5562	181.2479	182.9439	203.2787	215.2209	239.1618	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.7207	85.5407	85.1837	84.4960	83.3316	79.8000	79.8000	79.8000	79.8000	84.2641	85.2751	85.7649	(217)
Fuel for water heating, kWh/month													
	281.9193	249.8345	266.8041	237.4923	234.0450	220.9492	218.7421	227.1276	229.2530	241.2400	252.3842	278.8574	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)

Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	29.5496	23.7058	21.3444	15.6378	12.0791	9.8687	11.0190	14.3229	18.6040	24.4095	27.5704	30.3709	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-38.9812	-55.1702	-79.5760	-89.7571	-96.9883	-90.5718	-89.4598	-84.3870	-75.4216	-63.2498	-42.9366	-33.6769	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-21.3144	-44.9402	-89.5251	-134.7575	-178.4789	-179.4591	-177.3409	-150.0006	-109.7478	-64.3537	-28.4842	-16.8460	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	3048.6426	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2938.6486	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	238.4821	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-2035.4247	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	4276.3487	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3048.6426	0.2100	640.2150	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2938.6486	0.2100	617.1162	(264)
Space and water heating			1257.3312	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	238.4821	0.1443	34.4203	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-840.1762	0.1345	-113.0202	
PV Unit electricity exported	-1195.2485	0.1258	-150.3985	
Total			-263.4187	(269)
Total CO2, kg/year			1040.2621	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.4400	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	3048.6426	1.1300	3444.9662	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2938.6486	1.1300	3320.6730	(278)
Space and water heating			6765.6391	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	238.4821	1.5338	365.7919	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-840.1762	1.4972	-1257.8767	
PV Unit electricity exported	-1195.2485	0.4619	-552.0620	
Total			-1809.9387	(283)
Total Primary energy kWh/year			5451.5931	(286)
Target Primary Energy Rate (TPER)			59.9300	(287)

Full SAP Calculation Printout

Property Reference	78449-17	**Issued on Date**	03/10/2025
Assessment Reference	001	**Prop Type Ref**	Mid
Property	822 Rochdale Road, MANCHESTER, M9 8FA		

SAP Rating	84 B	**DER**	3.62	**TER**	11.44
Environmental	97 A	**% DER < TER**			68.36
CO_2 Emissions (t/year)	0.32	**DFEE**	34.10	**TFEE**	36.90
Compliance Check	See BREL	**% DFEE < TFEE**			7.58
% DPER < TPER	36.04	**DPER**	38.33	**TPER**	59.93

Assessor Details	Mr. Daniel Goddard	**Assessor ID**	CP52-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	41.1800 (1b)	x	2.4800 (2b)	=	102.1264	(1b) - (3b)
First floor	49.7800 (1c)	x	2.7800 (2c)	=	138.3884	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	90.9600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	240.5148	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1247	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3747	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3185	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4061	0.3982	0.3902	0.3504	0.3424	0.3026	0.3026	0.2946	0.3185	0.3424	0.3583	0.3743	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0.0000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5825	0.5793	0.5761	0.5614	0.5586	0.5458	0.5458	0.5434	0.5507	0.5586	0.5642	0.5700	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door			4.1400	1.0000	4.1400			(26)
Window			8.5100	0.7752	6.5969			(27)
GF			41.1800	0.0800	3.2944	75.0000	3088.5000	(28a)
Exposed Floor			8.6000	0.1400	1.2040	20.0000	172.0000	(28b)
Main	64.8536	12.6500	52.2036	0.1300	6.7865	9.0000	469.8324	(29a)
PIJ	49.7800		49.7800	0.1300	6.4714	9.0000	448.0200	(30)
Total net area of external elements Aum(A, m2)			164.4136					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	28.4932			(33)
Main dwelling								
Party Wall 1			88.2100	0.0000	0.0000	20.0000	1764.2000	(32)
Timber			96.4800			9.0000	868.3200	(32c)
FF			41.1800			18.0000	741.2400	(32d)
GF			41.1800			9.0000	370.6200	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	7922.7324 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		87.1013 (35)
List of Thermal Bridges		

	Length	Psi-value	Total	
K1 Element				
E2 Other lintels (including other steel lintels)	8.6300	0.1150	0.9925	
E3 Sill	8.6300	0.0170	0.1467	
E4 Jamb	28.2000	0.0940	2.6508	
E5 Ground floor (normal)	13.8200	0.0670	0.9259	
E16 Corner (normal)	4.9600	0.0680	0.3373	
E12 Gable (insulation at ceiling level)	11.0000	0.0770	0.8470	
E6 Intermediate floor within a dwelling	11.0000	0.0320	0.3520	
E17 Corner (inverted - internal area greater than external area)	4.9600	-0.0290	-0.1438	
P1 Party wall - Ground floor	15.2800	0.3200	4.8896	
E20 Exposed floor (normal)	6.4400	0.0790	0.5088	
E21 Exposed floor (inverted)	12.0800	0.0630	0.7610	
E18 Party wall between dwellings	21.0400	0.0920	1.9357	
P4 Party wall - Roof (insulation at ceiling level)	18.1000	0.1020	1.8462	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			16.0496	(36)
Point Thermal bridges		(36a) =	0.0000	
Total fabric heat loss		(33) + (36) + (36a) =	44.5428	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	46.2302	45.9760	45.7269	44.5568	44.3378	43.3187	43.3187	43.1299	43.7112	44.3378	44.7807	45.2438	(38)
Heat transfer coeff	90.7730	90.5188	90.2697	89.0996	88.8806	87.8615	87.8615	87.6727	88.2540	88.8806	89.3235	89.7865	(39)
Average = Sum(39)m / 12 =												89.0985	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9979	0.9951	0.9924	0.9795	0.9771	0.9659	0.9659	0.9639	0.9703	0.9771	0.9820	0.9871	(40)
HLP (average)												0.9795	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy											2.6386	(42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	29.5637	29.1246	28.5063	27.3663	26.5127	25.5661	25.0549	25.6688	26.3373	27.3502	28.5137	29.4637	(42b)
Hot water usage for other uses	41.6522	40.1376	38.6230	37.1084	35.5937	34.0791	34.0791	35.5937	37.1084	38.6230	40.1376	41.6522	(42c)
Average daily hot water use (litres/day)												65.2759	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	71.2159	69.2622	67.1293	64.4747	62.1064	59.6452	59.1340	61.2626	63.4457	65.9732	68.6513	71.1160	(44)
Energy conte	112.7886	98.6285	103.1753	88.2626	83.6072	73.3408	71.5174	75.8559	78.2349	89.5249	97.8063	111.3504	(45)
Energy content (annual)										Total = Sum(45)m =		1084.0928	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	95.8703	83.8342	87.6990	75.0232	71.0661	62.3397	60.7898	64.4775	66.4996	76.0962	83.1354	94.6479	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	95.8703	83.8342	87.6990	75.0232	71.0661	62.3397	60.7898	64.4775	66.4996	76.0962	83.1354	94.6479	(64)
									Total per year (kWh/year) = Sum(64)m =			921.4789	(64)
12Total per year (kWh/year)												921	(64)
Electric shower(s)	54.8258	48.8503	53.3426	50.9042	51.8594	49.4688	51.1178	51.8594	50.9042	53.3426	52.3396	54.8258	(64a)
					Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =							623.6406	(64a)
Heat gains from water heating, kWh/month	37.6740	33.1711	35.2604	31.4819	30.7314	27.9521	27.9769	29.0842	29.3510	32.3597	33.8687	37.3684	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	145.9975	161.6401	145.9975	150.8641	145.9975	150.8641	145.9975	145.9975	150.8641	145.9975	150.8641	145.9975	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	240.8328	243.3319	237.0343	223.6274	206.7036	190.7976	180.1714	177.6723	183.9699	197.3768	214.3007	230.2066	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	(71)
Water heating gains (Table 5)	50.6372	49.3618	47.3930	43.7248	41.3056	38.8224	37.6034	39.0917	40.7652	43.4942	47.0399	50.2264	(72)
Total internal gains	500.0470	516.9133	493.0043	480.7957	456.5862	443.0635	426.3517	425.3410	438.1787	449.4480	474.7841	489.0100	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	4.9800	19.6403	0.3000	0.0000	0.7700	22.5938	(76)
West	3.5300	19.6403	0.3000	0.0000	0.7700	16.0153	(80)

Solar gains	38.6090	75.5274	124.3829	181.4051	222.3188	227.5828	216.6681	186.1147	144.6625	89.6197	48.1409	31.7502	(83)

Total gains	538.6560	592.4407	617.3872	662.2009	678.9049	670.6464	643.0199	611.4557	582.8412	539.0677	522.9250	520.7602	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	24.2446	24.3127	24.3798	24.7000	24.7608	25.0481	25.0481	25.1020	24.9366	24.7608	24.6381	24.5110	
alpha	2.6163	2.6208	2.6253	2.6467	2.6507	2.6699	2.6699	2.6735	2.6624	2.6507	2.6425	2.6341	
util living area	0.9559	0.9417	0.9214	0.8722	0.7931	0.6608	0.5283	0.5653	0.7427	0.8840	0.9385	0.9594	(86)
MIT	18.4198	18.6789	19.0881	19.7002	20.2511	20.6888	20.8776	20.8494	20.5410	19.8360	19.0522	18.3883	(87)
Th 2	20.0850	20.0874	20.0897	20.1004	20.1024	20.1118	20.1118	20.1136	20.1082	20.1024	20.0984	20.0941	(88)
util rest of house	0.9503	0.9342	0.9107	0.8536	0.7597	0.6014	0.4422	0.4812	0.6918	0.8635	0.9294	0.9542	(89)
MIT 2	17.7111	17.9680	18.3730	18.9767	19.5019	19.9005	20.0485	20.0317	19.7770	19.1170	18.3471	17.6860	(90)
Living area fraction										fLA = Living area / (4) =		0.3196	(91)
MIT	17.9375	18.1952	18.6016	19.2080	19.7413	20.1525	20.3135	20.2930	20.0212	19.3468	18.5724	17.9105	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.9375	18.1952	18.6016	19.2080	19.7413	20.1525	20.3135	20.2930	20.0212	19.3468	18.5724	17.9105	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9326	0.9142	0.8887	0.8315	0.7445	0.6044	0.4629	0.4994	0.6862	0.8424	0.9094	0.9374	(94)
Useful gains	502.3694	541.5870	548.6931	550.6202	505.4243	405.3280	297.6315	305.3646	399.9404	454.1350	475.5614	488.1676	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1237.9208	1203.4648	1092.4050	918.4345	714.7182	487.8473	326.2740	341.3136	522.5687	777.4204	1024.7572	1231.0144	(97)
Space heating kWh	547.2502	444.7819	404.5217	264.8262	155.7146	0.0000	0.0000	0.0000	0.0000	240.5244	395.4210	552.6780	(98a)
Space heating requirement - total per year (kWh/year)												3005.7180	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	547.2502	444.7819	404.5217	264.8262	155.7146	0.0000	0.0000	0.0000	0.0000	240.5244	395.4210	552.6780	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3005.7180	
Space heating per m2											(98c) / (4) =	33.0444	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	825.8978	650.1748	666.3128	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.6697	0.7435	0.7164	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	553.1317	483.4155	477.3560	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	708.6181	679.8104	645.9957	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	111.9502	146.1178	125.4679	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	27.9876	36.5295	31.3670	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												95.8840	(107)
Energy for space heating												33.0444	(99)
Energy for space cooling												1.0541	(108)
Total												34.0985	(109)
Fabric Energy Efficiency (DFEE)												34.1	(109)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	41.1800	(1b) x	2.4800	(2b) =	102.1264	(1b) - (3b)
First floor	49.7800	(1c) x	2.7800	(2c) =	138.3884	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	90.9600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		240.5148	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)

Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1247 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3747 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3185 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4061	0.3982	0.3902	0.3504	0.3424	0.3026	0.3026	0.2946	0.3185	0.3424	0.3583	0.3743	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5825	0.5793	0.5761	0.5614	0.5586	0.5458	0.5458	0.5434	0.5507	0.5586	0.5642	0.5700	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			4.1400	1.0000	4.1400			(26)
TER Opening Type			8.5100	1.1450	9.7443			(27)
GF			41.1800	0.1300	5.3534			(28a)
Exposed Floor			8.6000	0.1300	1.1180			(28b)
Main	64.8536	12.6500	52.2036	0.1800	9.3966			(29a)
PIJ	49.7800		49.7800	0.1100	5.4758			(30)
Total net area of external elements Aum(A, m2)			164.4136					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		35.2281			(33)
Main dwelling								
Party Wall 1			88.2100	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	87.1013 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	8.6300	0.0500	0.4315
E3 Sill	8.6300	0.0500	0.4315
E4 Jamb	28.2000	0.0500	1.4100
E5 Ground floor (normal)	13.8200	0.1600	2.2112
E16 Corner (normal)	4.9600	0.0900	0.4464
E12 Gable (insulation at ceiling level)	11.0000	0.0600	0.6600
E6 Intermediate floor within a dwelling	11.0000	0.0000	0.0000
E17 Corner (inverted - internal area greater than external area)	4.9600	-0.0900	-0.4464
P1 Party wall - Ground floor	15.2800	0.0800	1.2224
E20 Exposed floor (normal)	6.4400	0.3200	2.0608
E21 Exposed floor (inverted)	12.0800	0.3200	3.8656
E18 Party wall between dwellings	21.0400	0.0600	1.2624
P4 Party wall - Roof (insulation at ceiling level)	18.1000	0.1200	2.1720

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		15.7274 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	50.9555 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	46.2302	45.9760	45.7269	44.5568	44.3378	43.3187	43.3187	43.1299	43.7112	44.3378	44.7807	45.2438	(38)
Heat transfer coeff	97.1857	96.9316	96.6824	95.5123	95.2934	94.2742	94.2742	94.0855	94.6668	95.2934	95.7363	96.1993	(39)
Average = Sum(39)m / 12 =												95.5112	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0684	1.0657	1.0629	1.0500	1.0476	1.0364	1.0364	1.0344	1.0408	1.0476	1.0525	1.0576	(40)
HLP (average)												1.0500	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.6386 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

29.5637	29.1246	28.5063	27.3663	26.5127	25.5661	25.0549	25.6688	26.3373	27.3502	28.5137	29.4637	(42b)

Hot water usage for other uses

41.6522	40.1376	38.6230	37.1084	35.5937	34.0791	34.0791	35.5937	37.1084	38.6230	40.1376	41.6522	(42c)

Average daily hot water use (litres/day)	65.2759 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	71.2159	69.2622	67.1293	64.4747	62.1064	59.6452	59.1340	61.2626	63.4457	65.9732	68.6513	71.1160	(44)
Energy conte	112.7886	98.6285	103.1753	88.2626	83.6072	73.3408	71.5174	75.8559	78.2349	89.5249	97.8063	111.3504	(45)
Energy content (annual)										Total = Sum(45)m =		1084.0928	
Distribution loss (46)m = 0.15 x (45)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	95.8703	83.8342	87.6990	75.0232	71.0661	62.3397	60.7898	64.4775	66.4996	76.0962	83.1354	94.6479	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													

	95.8703	83.8342	87.6990	75.0232	71.0661	62.3397	60.7898	64.4775	66.4996	76.0962	83.1354	94.6479 (64)
									Total per year (kWh/year) = Sum(64)m =			921.4789 (64)
12Total per year (kWh/year)												921 (64)
Electric shower(s)												
	54.8258	48.8503	53.3426	50.9042	51.8594	49.4688	51.1178	51.8594	50.9042	53.3426	52.3396	54.8258 (64a)
								Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =				623.6406 (64a)
Heat gains from water heating, kWh/month												
	37.6740	33.1711	35.2604	31.4819	30.7314	27.9521	27.9769	29.0842	29.3510	32.3597	33.8687	37.3684 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	142.2156	157.4530	142.2156	146.9561	142.2156	146.9561	142.2156	142.2156	146.9561	142.2156	146.9561	142.2156	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	240.8328	243.3319	237.0343	223.6274	206.7036	190.7976	180.1714	177.6723	183.9699	197.3768	214.3007	230.2066	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	(71)
Water heating gains (Table 5)													
	50.6372	49.3618	47.3930	43.7248	41.3056	38.8224	37.6034	39.0917	40.7652	43.4942	47.0399	50.2264	(72)
Total internal gains													
	496.2651	512.7262	489.2224	476.8878	452.8043	439.1556	422.5699	421.5591	434.2708	445.6662	470.8762	485.2281	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	4.9800	19.6403	0.6300	0.7000	0.7700	29.8916	(76)
West	3.5300	19.6403	0.6300	0.7000	0.7700	21.1882	(80)

Solar gains	51.0797	99.9228	164.5586	239.9990	294.1277	301.0921	286.6519	246.2298	191.3885	118.5668	63.6904	42.0055	(83)
Total gains	547.3448	612.6490	653.7810	716.8868	746.9320	740.2477	709.2218	667.7889	625.6593	564.2330	534.5666	527.2336	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	22.6449	22.7043	22.7628	23.0416	23.0946	23.3442	23.3442	23.3911	23.2474	23.0946	22.9877	22.8771	
alpha	2.5097	2.5136	2.5175	2.5361	2.5396	2.5563	2.5563	2.5594	2.5498	2.5396	2.5325	2.5251	
util living area													
	0.9557	0.9398	0.9161	0.8613	0.7758	0.6421	0.5125	0.5525	0.7336	0.8808	0.9381	0.9594	(86)
MIT	18.2422	18.5281	18.9823	19.6407	20.2246	20.6750	20.8697	20.8378	20.5077	19.7511	18.9079	18.2044	(87)
Th 2	20.0267	20.0290	20.0312	20.0418	20.0438	20.0531	20.0531	20.0548	20.0495	20.0438	20.0398	20.0356	(88)
util rest of house													
	0.9499	0.9319	0.9044	0.8408	0.7395	0.5795	0.4228	0.4645	0.6796	0.8590	0.9287	0.9540	(89)
MIT 2	17.4981	17.7812	18.2298	18.8766	19.4303	19.8370	19.9879	19.9692	19.6997	18.9942	18.1669	17.4665	(90)
Living area fraction										fLA = Living area / (4) =		0.3196	(91)
MIT	17.7359	18.0199	18.4703	19.1208	19.6841	20.1048	20.2697	20.2468	19.9579	19.2361	18.4037	17.7023	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.7359	18.0199	18.4703	19.1208	19.6841	20.1048	20.2697	20.2468	19.9579	19.2361	18.4037	17.7023	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9312	0.9105	0.8807	0.8173	0.7241	0.5832	0.4446	0.4836	0.6738	0.8365	0.9075	0.9364	(94)
Useful gains	509.7024	557.7967	575.7672	585.8931	540.8308	431.7068	315.2887	322.9581	421.5423	471.9565	485.1347	493.6945	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1305.7780	1271.7336	1157.3180	976.2114	760.8353	518.9595	345.9597	361.9301	554.5528	822.9632	1082.1775	1298.9102	(97)
Space heating kWh													
	592.2802	479.7656	432.6738	281.0292	163.6834	0.0000	0.0000	0.0000	0.0000	261.1490	429.8708	599.0805	(98a)
Space heating requirement - total per year (kWh/year)												3239.5326	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	592.2802	479.7656	432.6738	281.0292	163.6834	0.0000	0.0000	0.0000	0.0000	261.1490	429.8708	599.0805	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3239.5326	
Space heating per m2											(98c) / (4) =	35.6149	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	886.1775	697.6291	715.0496	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.6784	0.7494	0.7194	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	601.1936	522.8145	514.4272	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	794.2071	761.2522	715.7953	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	138.9697	177.3976	149.8178	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)

Space cooling kWh

0.0000	0.0000	0.0000	0.0000	0.0000	34.7424	44.3494	37.4545	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement											116.5463 (107)
Energy for space heating											35.6149 (99)
Energy for space cooling											1.2813 (108)
Total											36.8962 (109)
Fabric Energy Efficiency (TFEE)											36.9 (109)

Full SAP Calculation Printout

Property Reference	78449-17	**Issued on Date**	03/10/2025
Assessment Reference	001	**Prop Type Ref**	Mid
Property	822 Rochdale Road, MANCHESTER, M9 8FA		

SAP Rating	84 B	**DER**	3.62	**TER**	11.44
Environmental	97 A	**% DER < TER**			68.36
CO_2 Emissions (t/year)	0.32	**DFEE**	34.10	**TFEE**	36.90
Compliance Check	See BREL	**% DFEE < TFEE**			7.58
% DPER < TPER	36.04	**DPER**	38.33	**TPER**	59.93

Assessor Details	Mr. Daniel Goddard	**Assessor ID**	CP52-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	41.1800	(1b)	x 2.4800	(2b) =	102.1264	(1b) - (3b)
First floor	49.7800	(1c)	x 2.7800	(2c) =	138.3884	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	90.9600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		240.5148	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.2500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2125	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2709	0.2656	0.2603	0.2338	0.2284	0.2019	0.2019	0.1966	0.2125	0.2284	0.2391	0.2497	(22b)

Balanced mechanical ventilation with heat recovery		
If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =		81.0000 (23c)

Effective ac	0.3659	0.3606	0.3553	0.3287	0.3234	0.2969	0.2969	0.2916	0.3075	0.3234	0.3341	0.3447	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door			4.1400	1.0000	4.1400			(26)
Window			8.5100	0.7752	6.5969			(27)
GF			41.1800	0.0800	3.2944	75.0000	3088.5000	(28a)
Exposed Floor			8.6000	0.1400	1.2040	20.0000	172.0000	(28b)
Main	64.8536	12.6500	52.2036	0.1300	6.7865	9.0000	469.8324	(29a)
PIJ	49.7800		49.7800	0.1300	6.4714	9.0000	448.0200	(30)
Total net area of external elements Aum(A, m2)			164.4136					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		28.4932			(33)
Main dwelling								
Party Wall 1			88.2100	0.0000	0.0000	20.0000	1764.2000	(32)
Timber			96.4800			9.0000	868.3200	(32c)
FF			41.1800			18.0000	741.2400	(32d)
GF			41.1800			9.0000	370.6200	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 7922.7324 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 87.1013 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	8.6300	0.1150	0.9925
E3 Sill	8.6300	0.0170	0.1467
E4 Jamb	28.2000	0.0940	2.6508
E5 Ground floor (normal)	13.8200	0.0670	0.9259
E16 Corner (normal)	4.9600	0.0680	0.3373
E12 Gable (insulation at ceiling level)	11.0000	0.0770	0.8470
E6 Intermediate floor within a dwelling	11.0000	0.0320	0.3520
E17 Corner (inverted - internal area greater than external area)	4.9600	-0.0290	-0.1438
P1 Party wall - Ground floor	15.2800	0.3200	4.8896
E20 Exposed floor (normal)	6.4400	0.0790	0.5088
E21 Exposed floor (inverted)	12.0800	0.0630	0.7610
E18 Party wall between dwellings	21.0400	0.0920	1.9357
P4 Party wall - Roof (insulation at ceiling level)	18.1000	0.1020	1.8462

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 16.0496 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 44.5428 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	29.0444	28.6228	28.2011	26.0928	25.6712	23.5629	23.5629	23.1413	24.4062	25.6712	26.5145	27.3578	(38)
Heat transfer coeff	73.5872	73.1656	72.7439	70.6356	70.2140	68.1057	68.1057	67.6841	68.9490	70.2140	71.0573	71.9006	(39)
Average = Sum(39)m / 12 =												70.5302	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8090	0.8044	0.7997	0.7766	0.7719	0.7487	0.7487	0.7441	0.7580	0.7719	0.7812	0.7905	(40)
HLP (average)												0.7754	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6386 (42)
Hot water usage for mixer showers

68.4610	67.4321	65.9329	63.0644	60.9476	58.5869	57.2450	58.7329	60.3639	62.8986	65.8287	68.1987	(42a)

Hot water usage for baths

29.5637	29.1246	28.5063	27.3663	26.5127	25.5661	25.0549	25.6688	26.3373	27.3502	28.5137	29.4637	(42b)

Hot water usage for other uses

41.6522	40.1376	38.6230	37.1084	35.5937	34.0791	34.0791	35.5937	37.1084	38.6230	40.1376	41.6522	(42c)

Average daily hot water use (litres/day) 128.3946 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	139.6769	136.6944	133.0622	127.5391	123.0540	118.2321	116.3790	119.9955	123.8096	128.8717	134.4799	139.3147	(44)
Energy conte	221.2141	194.6510	204.5117	174.5947	165.6543	145.3802	140.7503	148.5795	152.6696	174.8777	191.5913	218.1331	(45)
Energy content (annual)										Total = Sum(45)m =		2132.6075	

Distribution loss (46)m = 0.15 x (45)m

33.1821	29.1976	30.6768	26.1892	24.8482	21.8070	21.1126	22.2869	22.9004	26.2317	28.7387	32.7200	(46)

Water storage loss:
Store volume 210.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.5800 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.8532 (55)
Total storage loss

26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(56)

If cylinder contains dedicated solar storage

26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(57)
23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Primary loss
Combi loss
Total heat required for water heating calculated for each month

270.9257	239.5518	254.2233	222.7027	215.3659	193.4882	190.4619	198.2911	200.7776	224.5893	239.6993	267.8447	(62)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

WWHRS
PV diverter
Solar input
FGHRS
Output from w/h

270.9257	239.5518	254.2233	222.7027	215.3659	193.4882	190.4619	198.2911	200.7776	224.5893	239.6993	267.8447	(64)

Total per year (kWh/year) = Sum(64)m = 2717.9215 (64)
12Total per year (kWh/year) 2718 (64)
Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)
Heat gains from water heating, kWh/month

113.3230	100.6421	107.7694	96.5391	94.8493	86.8253	86.5688	89.1720	89.2490	97.9161	102.1905	112.2985	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	145.9975	161.6401	145.9975	150.8641	145.9975	150.8641	145.9975	145.9975	150.8641	145.9975	150.8641	145.9975	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	240.8328	243.3319	237.0343	223.6274	206.7036	190.7976	180.1714	177.6723	183.9699	197.3768	214.3007	230.2066	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	(71)
Water heating gains (Table 5)	152.3158	149.7650	144.8514	134.0821	127.4857	120.5907	116.3559	119.8548	123.9570	131.6077	141.9313	150.9389	(72)
Total internal gains	601.7256	617.3165	590.4626	571.1531	542.7662	524.8319	505.1042	506.1041	521.3705	537.5615	569.6755	589.7225	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a	g Specific data	FF Specific data	Access factor	Gains W

					W/m2	or Table 6b		or Table 6c		Table 6d			
East					4.9800	19.6403		0.3000	0.0000	0.7700		22.5938	(76)
West					3.5300	19.6403		0.3000	0.0000	0.7700		16.0153	(80)
Solar gains	38.6090	75.5274	124.3829	181.4051	222.3188	227.5828	216.6681	186.1147	144.6625	89.6197	48.1409	31.7502	(83)
Total gains	640.3346	692.8439	714.8456	752.5582	765.0850	752.4147	721.7724	692.2188	666.0330	627.1812	617.8164	621.4727	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	29.9068	30.0792	30.2535	31.1565	31.3436	32.3139	32.3139	32.5152	31.9186	31.3436	30.9716	30.6084	
alpha	2.9938	3.0053	3.0169	3.0771	3.0896	3.1543	3.1543	3.1677	3.1279	3.0896	3.0648	3.0406	
util living area	0.9265	0.9051	0.8739	0.8005	0.6927	0.5307	0.3996	0.4294	0.6194	0.8096	0.8956	0.9309	(86)
Living	19.2282	19.4614	19.7964	20.2867	20.6516	20.8954	20.9678	20.9595	20.8198	20.3698	19.7744	19.2315	
Non living	18.6144	18.8450	19.1745	19.6594	20.0000	20.2268	20.2808	20.2795	20.1607	19.7473	19.1690	18.6294	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.0936	19.4614	19.7964	20.2867	20.6516	20.8954	20.9678	20.9595	20.8198	20.3698	19.7744	19.4788	(87)
Th 2	20.2455	20.2495	20.2536	20.2737	20.2777	20.2980	20.2980	20.3020	20.2899	20.2777	20.2697	20.2616	(88)
util rest of house	0.9187	0.8951	0.8602	0.7788	0.6590	0.4827	0.3406	0.3702	0.5727	0.7849	0.8832	0.9236	(89)
MIT 2	19.4111	18.8450	19.1745	19.6594	20.0000	20.2268	20.2808	20.2795	20.1607	19.7473	19.1690	18.8577	(90)
Living area fraction										fLA = Living area / (4) =		0.3196	(91)
MIT	19.6292	19.0420	19.3732	19.8599	20.2082	20.4405	20.5004	20.4968	20.3713	19.9462	19.3625	19.0562	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6292	19.0420	19.3732	19.8599	20.2082	20.4405	20.5004	20.4968	20.3713	19.9462	19.3625	19.0562	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9114	0.8762	0.8417	0.7653	0.6556	0.4927	0.3579	0.3870	0.5783	0.7723	0.8653	0.9093	(94)
Useful gains	583.6055	607.0518	601.6955	575.9327	501.6028	370.7506	258.3504	267.9168	385.1931	484.3734	534.5741	565.0785	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1128.0364	1034.7055	936.4503	774.1591	597.3978	397.7702	265.6377	277.2882	432.4032	656.2346	871.3380	1068.1696	(97)
Space heating kWh	405.0565	287.3833	249.0575	142.7230	71.2714	0.0000	0.0000	0.0000	0.0000	127.8647	242.4700	374.2997	(98a)
Space heating requirement - total per year (kWh/year)												1900.1263	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	405.0565	287.3833	249.0575	142.7230	71.2714	0.0000	0.0000	0.0000	0.0000	127.8647	242.4700	374.2997	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1900.1263	
Space heating per m2											(98c) / (4) =	20.8897	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												270.7081	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	405.0565	287.3833	249.0575	142.7230	71.2714	0.0000	0.0000	0.0000	0.0000	127.8647	242.4700	374.2997	(98)
Space heating efficiency (main heating system 1)	270.7081	270.7081	270.7081	270.7081	270.7081	0.0000	0.0000	0.0000	0.0000	270.7081	270.7081	270.7081	(210)
Space heating fuel (main heating system)	149.6285	106.1598	92.0022	52.7221	26.3278	0.0000	0.0000	0.0000	0.0000	47.2334	89.5688	138.2669	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	270.9257	239.5518	254.2233	222.7027	215.3659	193.4882	190.4619	198.2911	200.7776	224.5893	239.6993	267.8447	(64)
Efficiency of water heater												281.1060	(216)
(217)m	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	(217)
Fuel for water heating, kWh/month	96.3785	85.2176	90.4368	79.2237	76.6138	68.8310	67.7545	70.5396	71.4242	79.8949	85.2701	95.2824	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	29.6563	26.7864	29.6563	28.6997	29.6563	28.6997	29.6563	29.6563	28.6997	29.6563	28.6997	29.6563	(231)
Lighting	30.8703	24.7653	22.2984	16.3368	12.6190	10.3098	11.5115	14.9631	19.4355	25.5005	28.8027	31.7283	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	701.9096	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	281.1060	
Water heating fuel used	966.8671	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.1900)		
mechanical ventilation fans (SFP = 1.1900)	349.1794	(230a)
Total electricity for the above, kWh/year	349.1794	(231)
Electricity for lighting (calculated in Appendix L)	249.1413	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2267.0974	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	701.9096	0.1552	108.9520	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	966.8671	0.1410	136.2905	(264)
Space and water heating			245.2426	(265)
Pumps, fans and electric keep-hot	349.1794	0.1387	48.4355	(267)
Energy for lighting	249.1413	0.1443	35.9588	(268)
Total CO2, kg/year			329.6368	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.6200	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	701.9096	1.5746	1105.2587	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	966.8671	1.5212	1470.8230	(278)
Space and water heating			2576.0817	(279)
Pumps, fans and electric keep-hot	349.1794	1.5128	528.2386	(281)
Energy for lighting	249.1413	1.5338	382.1413	(282)
Total Primary energy kWh/year			3486.4616	(286)
Dwelling Primary energy Rate (DPER)			38.3300	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	41.1800	(1b)	x 2.4800	(2b) =	102.1264	(1b) - (3b)
First floor	49.7800	(1c)	x 2.7800	(2c) =	138.3884	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	90.9600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		240.5148	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1247	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3747	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3185	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)

Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4061	0.3982	0.3902	0.3504	0.3424	0.3026	0.3026	0.2946	0.3185	0.3424	0.3583	0.3743 (22b)
Effective ac	0.5825	0.5793	0.5761	0.5614	0.5586	0.5458	0.5458	0.5434	0.5507	0.5586	0.5642	0.5700 (25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			4.1400	1.0000	4.1400			(26)
TER Opening Type			8.5100	1.1450	9.7443			(27)
GF			41.1800	0.1300	5.3534			(28a)
Exposed Floor			8.6000	0.1300	1.1180			(28b)
Main	64.8536	12.6500	52.2036	0.1800	9.3966			(29a)
PIJ	49.7800		49.7800	0.1100	5.4758			(30)
Total net area of external elements Aum(A, m2)			164.4136					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	35.2281			(33)
Main dwelling								
Party Wall 1			88.2100	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	87.1013	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	8.6300	0.0500	0.4315
E3 Sill	8.6300	0.0500	0.4315
E4 Jamb	28.2000	0.0500	1.4100
E5 Ground floor (normal)	13.8200	0.1600	2.2112
E16 Corner (normal)	4.9600	0.0900	0.4464
E12 Gable (insulation at ceiling level)	11.0000	0.0600	0.6600
E6 Intermediate floor within a dwelling	11.0000	0.0000	0.0000
E17 Corner (inverted - internal area greater than external area)	4.9600	-0.0900	-0.4464
P1 Party wall - Ground floor	15.2800	0.0800	1.2224
E20 Exposed floor (normal)	6.4400	0.3200	2.0608
E21 Exposed floor (inverted)	12.0800	0.3200	3.8656
E18 Party wall between dwellings	21.0400	0.0600	1.2624
P4 Party wall - Roof (insulation at ceiling level)	18.1000	0.1200	2.1720

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		15.7274	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	50.9555	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	46.2302	45.9760	45.7269	44.5568	44.3378	43.3187	43.3187	43.1299	43.7112	44.3378	44.7807	45.2438	(38)
Heat transfer coeff	97.1857	96.9316	96.6824	95.5123	95.2934	94.2742	94.2742	94.0855	94.6668	95.2934	95.7363	96.1993	(39)
Average = Sum(39)m / 12 =												95.5112	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0684	1.0657	1.0629	1.0500	1.0476	1.0364	1.0364	1.0344	1.0408	1.0476	1.0525	1.0576	(40)
HLP (average)												1.0500	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy											2.6386	(42)
Hot water usage for mixer showers	68.4610	67.4321	65.9329	63.0644	60.9476	58.5869	57.2450	58.7329	60.3639	62.8986	65.8287	68.1987 (42a)
Hot water usage for baths	29.5637	29.1246	28.5063	27.3663	26.5127	25.5661	25.0549	25.6688	26.3373	27.3502	28.5137	29.4637 (42b)
Hot water usage for other uses	41.6522	40.1376	38.6230	37.1084	35.5937	34.0791	34.0791	35.5937	37.1084	38.6230	40.1376	41.6522 (42c)
Average daily hot water use (litres/day)												128.3946 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	139.6769	136.6944	133.0622	127.5391	123.0540	118.2321	116.3790	119.9955	123.8096	128.8717	134.4799	139.3147	(44)
Energy conte	221.2141	194.6510	204.5117	174.5947	165.6543	145.3802	140.7503	148.5795	152.6696	174.8777	191.5913	218.1331	(45)
Energy content (annual)										Total = Sum(45)m =		2132.6075	
Distribution loss (46)m = 0.15 x (45)m	33.1821	29.1976	30.6768	26.1892	24.8482	21.8070	21.1126	22.2869	22.9004	26.2317	28.7387	32.7200	(46)
Water storage loss:													
Store volume												210.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7016	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.9188	(55)
Total storage loss	28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842	(56)
If cylinder contains dedicated solar storage	28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	272.9607	241.3898	256.2583	224.6720	217.4009	195.4575	192.4969	200.3261	202.7469	226.6243	241.6687	269.8797	(62)
WWHRS	-31.2975	-27.6798	-28.9847	-24.0004	-22.3675	-19.1401	-17.9408	-19.0782	-19.8031	-23.3456	-26.4477	-30.7179	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	241.6632	213.7101	227.2737	200.6716	195.0334	176.3175	174.5562	181.2479	182.9439	203.2787	215.2209	239.1618	(64)
										Total per year (kWh/year) = Sum(64)m =		2451.0786	(64)
12Total per year (kWh/year)												2451	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	114.9510	102.1125	109.3974	98.1146	96.4773	88.4008	88.1968	90.7999	90.8245	99.5441	103.7660	113.9265	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

(66)m	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	131.9317	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	142.2156	157.4530	142.2156	146.9561	142.2156	146.9561	142.2156	142.2156	146.9561	142.2156	146.9561	142.2156	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	240.8328	243.3319	237.0343	223.6274	206.7036	190.7976	180.1714	177.6723	183.9699	197.3768	214.3007	230.2066	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	36.1932	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	(71)
Water heating gains (Table 5)													
	154.5040	151.9532	147.0395	136.2703	129.6738	122.7789	118.5440	122.0429	126.1452	133.7959	144.1194	153.1270	(72)
Total internal gains													
	603.1319	618.3176	591.8689	572.4333	544.1725	523.1121	503.5105	504.5103	519.6507	538.9678	570.9557	591.1288	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	4.9800	19.6403	0.6300	0.7000	0.7700	29.8916	(76)
West	3.5300	19.6403	0.6300	0.7000	0.7700	21.1882	(80)

Solar gains	51.0797	99.9228	164.5586	239.9990	294.1277	301.0921	286.6519	246.2298	191.3885	118.5668	63.6904	42.0055	(83)
Total gains	654.2116	718.2404	756.4276	812.4323	838.3003	824.2042	790.1625	750.7401	711.0392	657.5346	634.6461	633.1343	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	22.6449	22.7043	22.7628	23.0416	23.0946	23.3442	23.3442	23.3911	23.2474	23.0946	22.9877	22.8771	
alpha	2.5097	2.5136	2.5175	2.5361	2.5396	2.5563	2.5563	2.5594	2.5498	2.5396	2.5325	2.5251	
util living area													
	0.9363	0.9179	0.8900	0.8294	0.7371	0.6002	0.4715	0.5071	0.6872	0.8450	0.9135	0.9408	(86)
MIT	18.4665	18.7376	19.1692	19.7832	20.3219	20.7241	20.8928	20.8676	20.5829	19.8994	19.1053	18.4305	(87)
Th 2	20.0267	20.0290	20.0312	20.0418	20.0438	20.0531	20.0531	20.0548	20.0495	20.0438	20.0398	20.0356	(88)
util rest of house													
	0.9284	0.9077	0.8757	0.8060	0.6983	0.5374	0.3858	0.4222	0.6306	0.8190	0.9010	0.9333	(89)
MIT 2	17.0633	17.4054	17.9489	18.7154	19.3635	19.8213	19.9856	19.9670	19.6760	18.8716	17.8806	17.0230	(90)
Living area fraction										fLA = Living area / (4) =		0.3196	(91)
MIT	17.5118	17.8312	18.3389	19.0566	19.6698	20.1098	20.2755	20.2548	19.9659	19.2001	18.2720	17.4728	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.5118	17.8312	18.3389	19.0566	19.6698	20.1098	20.2755	20.2548	19.9659	19.2001	18.2720	17.4728	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9004	0.8773	0.8442	0.7775	0.6812	0.5414	0.4069	0.4412	0.6251	0.7913	0.8712	0.9063	(94)
Useful gains	589.0216	630.1383	638.5494	631.6864	571.0784	446.2550	321.5222	331.1952	444.4610	520.3070	552.8988	573.8331	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1283.9967	1253.4418	1144.6149	970.0843	759.4665	519.4329	346.5070	362.6828	555.3014	819.5308	1069.5680	1276.8325	(97)
Space heating kWh													
	517.0614	418.8600	376.5127	243.6465	140.1607	0.0000	0.0000	0.0000	0.0000	222.6225	372.0018	523.0315	(98a)
Space heating requirement - total per year (kWh/year)												2813.8972	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	517.0614	418.8600	376.5127	243.6465	140.1607	0.0000	0.0000	0.0000	0.0000	222.6225	372.0018	523.0315	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2813.8972	
Space heating per m2											(98c) / (4) =	30.9355	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	517.0614	418.8600	376.5127	243.6465	140.1607	0.0000	0.0000	0.0000	0.0000	222.6225	372.0018	523.0315	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	560.1966	453.8028	407.9227	263.9724	151.8534	0.0000	0.0000	0.0000	0.0000	241.1945	403.0355	566.6647	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	241.6632	213.7101	227.2737	200.6716	195.0334	176.3175	174.5562	181.2479	182.9439	203.2787	215.2209	239.1618	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.7207	85.5407	85.1837	84.4960	83.3316	79.8000	79.8000	79.8000	79.8000	84.2641	85.2751	85.7649	(217)
Fuel for water heating, kWh/month													
	281.9193	249.8345	266.8041	237.4923	234.0450	220.9492	218.7421	227.1276	229.2530	241.2400	252.3842	278.8574	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)

Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	29.5496	23.7058	21.3444	15.6378	12.0791	9.8687	11.0190	14.3229	18.6040	24.4095	27.5704	30.3709	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-38.9812	-55.1702	-79.5760	-89.7571	-96.9883	-90.5718	-89.4598	-84.3870	-75.4216	-63.2498	-42.9366	-33.6769	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-21.3144	-44.9402	-89.5251	-134.7575	-178.4789	-179.4591	-177.3409	-150.0006	-109.7478	-64.3537	-28.4842	-16.8460	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	3048.6426	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2938.6486	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	238.4821	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-2035.4247	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	4276.3487	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3048.6426	0.2100	640.2150	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2938.6486	0.2100	617.1162	(264)
Space and water heating			1257.3312	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	238.4821	0.1443	34.4203	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-840.1762	0.1345	-113.0202	
PV Unit electricity exported	-1195.2485	0.1258	-150.3985	
Total			-263.4187	(269)
Total CO2, kg/year			1040.2621	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.4400	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	3048.6426	1.1300	3444.9662	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2938.6486	1.1300	3320.6730	(278)
Space and water heating			6765.6391	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	238.4821	1.5338	365.7919	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-840.1762	1.4972	-1257.8767	
PV Unit electricity exported	-1195.2485	0.4619	-552.0620	
Total			-1809.9387	(283)
Total Primary energy kWh/year			5451.5931	(286)
Target Primary Energy Rate (TPER)			59.9300	(287)

Full SAP Calculation Printout

Property Reference	78449-17	**Issued on Date**	03/10/2025
Assessment Reference	001	**Prop Type Ref**	Mid
Property	822 Rochdale Road, MANCHESTER, M9 8FA		

SAP Rating	84 B	**DER**	3.62	**TER**	11.44
Environmental	97 A	**% DER < TER**			68.36
CO_2 Emissions (t/year)	0.32	**DFEE**	34.10	**TFEE**	36.90
Compliance Check	See BREL	**% DFEE < TFEE**			7.58
% DPER < TPER	36.04	**DPER**	38.33	**TPER**	59.93

Assessor Details	Mr. Daniel Goddard	**Assessor ID**	CP52-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	41.1800	(1b)	x 2.4800	(2b) =	102.1264	(1b) - (3b)
First floor	49.7800	(1c)	x 2.7800	(2c) =	138.3884	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	90.9600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		240.5148	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.2500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2125	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2709	0.2656	0.2603	0.2338	0.2284	0.2019	0.2019	0.1966	0.2125	0.2284	0.2391	0.2497	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	81.0000	(23c)

Effective ac	0.3659	0.3606	0.3553	0.3287	0.3234	0.2969	0.2969	0.2916	0.3075	0.3234	0.3341	0.3447	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door			4.1400	1.0000	4.1400			(26)
Window			8.5100	0.7752	6.5969			(27)
GF			41.1800	0.0800	3.2944	75.0000	3088.5000	(28a)
Exposed Floor			8.6000	0.1400	1.2040	20.0000	172.0000	(28b)
Main	64.8536	12.6500	52.2036	0.1300	6.7865	9.0000	469.8324	(29a)
PIJ	49.7800		49.7800	0.1300	6.4714	9.0000	448.0200	(30)
Total net area of external elements Aum(A, m2)			164.4136					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		28.4932			(33)
Main dwelling								
Party Wall 1			88.2100	0.0000	0.0000	20.0000	1764.2000	(32)
Timber			96.4800			9.0000	868.3200	(32c)
FF			41.1800			18.0000	741.2400	(32d)
GF			41.1800			9.0000	370.6200	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	7922.7324	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		87.1013	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	8.6300	0.1150	0.9925
E3 Sill	8.6300	0.0170	0.1467
E4 Jamb	28.2000	0.0940	2.6508
E5 Ground floor (normal)	13.8200	0.0670	0.9259
E16 Corner (normal)	4.9600	0.0680	0.3373
E12 Gable (insulation at ceiling level)	11.0000	0.0770	0.8470
E6 Intermediate floor within a dwelling	11.0000	0.0320	0.3520
E17 Corner (inverted - internal area greater than external area)	4.9600	-0.0290	-0.1438
P1 Party wall - Ground floor	15.2800	0.3200	4.8896
E20 Exposed floor (normal)	6.4400	0.0790	0.5088
E21 Exposed floor (inverted)	12.0800	0.0630	0.7610
E18 Party wall between dwellings	21.0400	0.0920	1.9357
P4 Party wall - Roof (insulation at ceiling level)	18.1000	0.1020	1.8462

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		16.0496	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	44.5428	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	29.0444	28.6228	28.2011	26.0928	25.6712	23.5629	23.5629	23.1413	24.4062	25.6712	26.5145	27.3578	(38)
Heat transfer coeff	73.5872	73.1656	72.7439	70.6356	70.2140	68.1057	68.1057	67.6841	68.9490	70.2140	71.0573	71.9006	(39)
Average = Sum(39)m / 12 =												70.5302	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8090	0.8044	0.7997	0.7766	0.7719	0.7487	0.7487	0.7441	0.7580	0.7719	0.7812	0.7905	(40)
HLP (average)												0.7754	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.6386	(42)
Hot water usage for mixer showers	68.4610	67.4321	65.9329	63.0644	60.9476	58.5869	57.2450	58.7329	60.3639	62.8986	65.8287	68.1987	(42a)
Hot water usage for baths	29.5637	29.1246	28.5063	27.3663	26.5127	25.5661	25.0549	25.6688	26.3373	27.3502	28.5137	29.4637	(42b)
Hot water usage for other uses	41.6522	40.1376	38.6230	37.1084	35.5937	34.0791	34.0791	35.5937	37.1084	38.6230	40.1376	41.6522	(42c)
Average daily hot water use (litres/day)												128.3946	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	139.6769	136.6944	133.0622	127.5391	123.0540	118.2321	116.3790	119.9955	123.8096	128.8717	134.4799	139.3147	(44)
Energy conte	221.2141	194.6510	204.5117	174.5947	165.6543	145.3802	140.7503	148.5795	152.6696	174.8777	191.5913	218.1331	(45)
Energy content (annual)										Total = Sum(45)m =		2132.6075	
Distribution loss (46)m = 0.15 x (45)m	33.1821	29.1976	30.6768	26.1892	24.8482	21.8070	21.1126	22.2869	22.9004	26.2317	28.7387	32.7200	(46)
Water storage loss:													
Store volume												210.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5800	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8532	(55)
Total storage loss	26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(56)
If cylinder contains dedicated solar storage	26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	270.9257	239.5518	254.2233	222.7027	215.3659	193.4882	190.4619	198.2911	200.7776	224.5893	239.6993	267.8447	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	270.9257	239.5518	254.2233	222.7027	215.3659	193.4882	190.4619	198.2911	200.7776	224.5893	239.6993	267.8447	(64)
										Total per year (kWh/year) = Sum(64)m =		2717.9215	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	113.3230	100.6421	107.7694	96.5391	94.8493	86.8253	86.5688	89.1720	89.2490	97.9161	102.1905	112.2985	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	35.2685	31.3252	25.4754	19.2865	14.4169	12.1713	13.1516	17.0949	22.9447	29.1336	34.0032	36.2488	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	359.4520	363.1820	353.7825	333.7722	308.5128	284.7725	268.9125	265.1825	274.5820	294.5923	319.8517	343.5920	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	(71)
Water heating gains (Table 5)	152.3158	149.7650	144.8514	134.0821	127.4857	120.5907	116.3559	119.8548	123.9570	131.6077	141.9313	150.9389	(72)
Total internal gains	653.2794	650.5153	630.3524	593.3839	556.6585	523.7777	504.6631	508.3753	527.7268	561.5767	602.0293	637.0228	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W

East				4.9800		19.6403		0.3000		0.0000		0.7700		22.5938 (76)
West				3.5300		19.6403		0.3000		0.0000		0.7700		16.0153 (80)
Solar gains	38.6090	75.5274	124.3829	181.4051	222.3188	227.5828	216.6681	186.1147	144.6625	89.6197	48.1409	31.7502	(83)
Total gains	691.8885	726.0427	754.7353	774.7891	778.9772	751.3605	721.3312	694.4900	672.3893	651.1964	650.1702	668.7729	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	29.9068	30.0792	30.2535	31.1565	31.3436	32.3139	32.3139	32.5152	31.9186	31.3436	30.9716	30.6084	
alpha	2.9938	3.0053	3.0169	3.0771	3.0896	3.1543	3.1543	3.1677	3.1279	3.0896	3.0648	3.0406	
util living area	0.9130	0.8953	0.8598	0.7904	0.6853	0.5313	0.3998	0.4281	0.6153	0.7969	0.8839	0.9186	(86)
Living	19.3352	19.5255	19.8642	20.3151	20.6625	20.8951	20.9678	20.9598	20.8232	20.4014	19.8348	19.3320	
Non living	18.7181	18.9066	19.2387	19.6852	20.0091	20.2266	20.2808	20.2797	20.1633	19.7757	19.2264	18.7270	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.1483	19.5255	19.8642	20.3151	20.6625	20.8951	20.9678	20.9598	20.8232	20.4014	19.8348	19.5653	(87)
Th 2	20.2455	20.2495	20.2536	20.2737	20.2777	20.2980	20.2980	20.3020	20.2899	20.2777	20.2697	20.2616	(88)
util rest of house	0.9039	0.8846	0.8451	0.7682	0.6514	0.4833	0.3408	0.3691	0.5687	0.7713	0.8706	0.9102	(89)
MIT 2	19.4642	18.9066	19.2387	19.6852	20.0091	20.2266	20.2808	20.2797	20.1633	19.7757	19.2264	18.9416	(90)
Living area fraction										fLA = Living area / (4) =		0.3196	(91)
MIT	19.6828	19.1044	19.4386	19.8865	20.2180	20.4402	20.5003	20.4970	20.3742	19.9756	19.4208	19.1409	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6828	19.1044	19.4386	19.8865	20.2180	20.4402	20.5003	20.4970	20.3742	19.9756	19.4208	19.1409	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8965	0.8654	0.8269	0.7553	0.6485	0.4933	0.3581	0.3859	0.5745	0.7596	0.8526	0.8952	(94)
Useful gains	620.2474	628.3480	624.1182	585.2252	505.1566	370.6474	258.3365	268.0102	386.2635	494.6223	554.3581	598.7034	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1131.9783	1039.2719	941.2033	776.0376	598.0796	397.7520	265.6354	277.3043	432.5995	658.3016	875.4841	1074.2629	(97)
Space heating kWh	380.7278	276.1409	235.9113	137.3849	69.1347	0.0000	0.0000	0.0000	0.0000	121.7775	231.2107	353.8162	(98a)
Space heating requirement - total per year (kWh/year)												1806.1040	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	380.7278	276.1409	235.9113	137.3849	69.1347	0.0000	0.0000	0.0000	0.0000	121.7775	231.2107	353.8162	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1806.1040	
Space heating per m2											(98c) / (4) =	19.8560	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												270.7081	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	380.7278	276.1409	235.9113	137.3849	69.1347	0.0000	0.0000	0.0000	0.0000	121.7775	231.2107	353.8162	(98)
Space heating efficiency (main heating system 1)	270.7081	270.7081	270.7081	270.7081	270.7081	0.0000	0.0000	0.0000	0.0000	270.7081	270.7081	270.7081	(210)
Space heating fuel (main heating system)	140.6414	102.0069	87.1460	50.7502	25.5385	0.0000	0.0000	0.0000	0.0000	44.9848	85.4096	130.7003	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	270.9257	239.5518	254.2233	222.7027	215.3659	193.4882	190.4619	198.2911	200.7776	224.5893	239.6993	267.8447	(64)
Efficiency of water heater												281.1060	(216)
(217)m	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	(217)
Fuel for water heating, kWh/month	96.3785	85.2176	90.4368	79.2237	76.6138	68.8310	67.7545	70.5396	71.4242	79.8949	85.2701	95.2824	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	29.6563	26.7864	29.6563	28.6997	29.6563	28.6997	29.6563	29.6563	28.6997	29.6563	28.6997	29.6563	(231)
Lighting	30.8703	24.7653	22.2984	16.3368	12.6190	10.3098	11.5115	14.9631	19.4355	25.5005	28.8027	31.7283	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													

Space heating fuel - main system 1	667.1777	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	281.1060	
Water heating fuel used	966.8671	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.1900)		
mechanical ventilation fans (SFP = 1.1900)	349.1794	(230a)
Total electricity for the above, kWh/year	349.1794	(231)
Electricity for lighting (calculated in Appendix L)	249.1413	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2232.3655	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	667.1777	16.4900	110.0176	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	966.8671	16.4900	159.4364	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	349.1794	16.4900	57.5797	(249)
Energy for lighting	249.1413	16.4900	41.0834	(250)
Additional standing charges			0.0000	(251)
Total energy cost			368.1171	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.9747	(257)
SAP value		84.1999	
SAP rating (Section 12)		84	(258)
SAP band		B	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	667.1777	0.1552	103.5263	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	966.8671	0.1410	136.2905	(264)
Space and water heating			239.8168	(265)
Pumps, fans and electric keep-hot	349.1794	0.1387	48.4355	(267)
Energy for lighting	249.1413	0.1443	35.9588	(268)
Total CO2, kg/year			324.2111	(272)
CO2 emissions per m2			3.5600	(273)
EI value			96.8046	
EI rating			97	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	41.1800 (1b)	x	2.4800 (2b)	=	102.1264	(1b) - (3b)
First floor	49.7800 (1c)	x	2.7800 (2c)	=	138.3884	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 90.9600						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		240.5148	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.2500 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2125 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.6000	4.5000	4.5000	4.1000	4.2000	3.7000	3.5000	3.5000	3.7000	4.1000	4.1000	4.2000	(22)
Wind factor	1.1500	1.1250	1.1250	1.0250	1.0500	0.9250	0.8750	0.8750	0.9250	1.0250	1.0250	1.0500	(22a)
Adj infilt rate	0.2444	0.2391	0.2391	0.2178	0.2231	0.1966	0.1859	0.1859	0.1966	0.2178	0.2178	0.2231	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	81.0000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.3394	0.3341	0.3341	0.3128	0.3181	0.2916	0.2809	0.2809	0.2916	0.3128	0.3128	0.3181	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door			4.1400	1.0000	4.1400			(26)
Window			8.5100	0.7752	6.5969			(27)
GF			41.1800	0.0800	3.2944	75.0000	3088.5000	(28a)
Exposed Floor			8.6000	0.1400	1.2040	20.0000	172.0000	(28b)
Main	64.8536	12.6500	52.2036	0.1300	6.7865	9.0000	469.8324	(29a)
PIJ	49.7800		49.7800	0.1300	6.4714	9.0000	448.0200	(30)
Total net area of external elements Aum(A, m2)			164.4136					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	28.4932			(33)
Main dwelling								
Party Wall 1			88.2100	0.0000	0.0000	20.0000	1764.2000	(32)
Timber			96.4800			9.0000	868.3200	(32c)
FF			41.1800			18.0000	741.2400	(32d)
GF			41.1800			9.0000	370.6200	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) =	7922.7324 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	87.1013 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	8.6300	0.1150	0.9925
E3 Sill	8.6300	0.0170	0.1467
E4 Jamb	28.2000	0.0940	2.6508
E5 Ground floor (normal)	13.8200	0.0670	0.9259
E16 Corner (normal)	4.9600	0.0680	0.3373
E12 Gable (insulation at ceiling level)	11.0000	0.0770	0.8470
E6 Intermediate floor within a dwelling	11.0000	0.0320	0.3520
E17 Corner (inverted - internal area greater than external area)	4.9600	-0.0290	-0.1438
P1 Party wall - Ground floor	15.2800	0.3200	4.8896
E20 Exposed floor (normal)	6.4400	0.0790	0.5088
E21 Exposed floor (inverted)	12.0800	0.0630	0.7610
E18 Party wall between dwellings	21.0400	0.0920	1.9357
P4 Party wall - Roof (insulation at ceiling level)	18.1000	0.1020	1.8462

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		16.0496 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	44.5428 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	26.9362	26.5145	26.5145	24.8279	25.2495	23.1413	22.2980	22.2980	23.1413	24.8279	24.8279	25.2495	(38)
Heat transfer coeff	71.4789	71.0573	71.0573	69.3707	69.7923	67.6841	66.8408	66.8408	67.6841	69.3707	69.3707	69.7923	(39)
Average = Sum(39)m / 12 =												69.1950	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7858	0.7812	0.7812	0.7627	0.7673	0.7441	0.7348	0.7348	0.7441	0.7627	0.7627	0.7673	(40)
HLP (average)												0.7607	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.6386 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	68.4610	67.4321	65.9329	63.0644	60.9476	58.5869	57.2450	58.7329	60.3639	62.8986	65.8287	68.1987	(42a)
Hot water usage for baths	29.5637	29.1246	28.5063	27.3663	26.5127	25.5661	25.0549	25.6688	26.3373	27.3502	28.5137	29.4637	(42b)
Hot water usage for other uses	41.6522	40.1376	38.6230	37.1084	35.5937	34.0791	34.0791	35.5937	37.1084	38.6230	40.1376	41.6522	(42c)
Average daily hot water use (litres/day)												128.3946	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	139.6769	136.6944	133.0622	127.5391	123.0540	118.2321	116.3790	119.9955	123.8096	128.8717	134.4799	139.3147	(44)
Energy conte	221.2141	194.6510	204.5117	174.5947	165.6543	145.3802	140.7503	148.5795	152.6696	174.8777	191.5913	218.1331	(45)
Energy content (annual)										Total = Sum(45)m =		2132.6075	
Distribution loss (46)m = 0.15 x (45)m	33.1821	29.1976	30.6768	26.1892	24.8482	21.8070	21.1126	22.2869	22.9004	26.2317	28.7387	32.7200	(46)

Water storage loss:	
Store volume	210.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):	1.5800 (48)
Temperature factor from Table 2b	0.5400 (49)
Enter (49) or (54) in (55)	0.8532 (55)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Total storage loss	26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(56)
If cylinder contains dedicated solar storage	26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

	270.9257	239.5518	254.2233	222.7027	215.3659	193.4882	190.4619	198.2911	200.7776	224.5893	239.6993	267.8447	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	270.9257	239.5518	254.2233	222.7027	215.3659	193.4882	190.4619	198.2911	200.7776	224.5893	239.6993	267.8447	(64)
											Total per year (kWh/year) = Sum(64)m =	2717.9215	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
											Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	0.0000	(64a)
Heat gains from water heating, kWh/month													
	113.3230	100.6421	107.7694	96.5391	94.8493	86.8253	86.5688	89.1720	89.2490	97.9161	102.1905	112.2985	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	35.2685	31.3252	25.4754	19.2865	14.4169	12.1713	13.1516	17.0949	22.9447	29.1336	34.0032	36.2488	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	359.4520	363.1820	353.7825	333.7722	308.5128	284.7725	268.9125	265.1825	274.5820	294.5923	319.8517	343.5920	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	(71)
Water heating gains (Table 5)													
	152.3158	149.7650	144.8514	134.0821	127.4857	120.5907	116.3559	119.8548	123.9570	131.6077	141.9313	150.9389	(72)
Total internal gains													
	653.2794	650.5153	630.3524	593.3839	556.6585	523.7777	504.6631	508.3753	527.7268	561.5767	602.0293	637.0228	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	4.9800	16.6187	0.3000	0.0000	0.7700	19.1178	(76)
West	3.5300	16.6187	0.3000	0.0000	0.7700	13.5514	(80)

Solar gains	32.6692	67.1355	116.6090	172.9395	207.2659	216.2037	201.7650	170.7039	137.1149	82.8303	42.3057	28.7264	(83)
Total gains	685.9486	717.6508	746.9614	766.3235	763.9244	739.9813	706.4281	679.0793	664.8417	644.4070	644.3350	665.7491	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	30.7889	30.9716	30.9716	31.7246	31.5330	32.5152	32.9254	32.9254	32.5152	31.7246	31.7246	31.5330	
alpha	3.0526	3.0648	3.0648	3.1150	3.1022	3.1677	3.1950	3.1950	3.1677	3.1150	3.1150	3.1022	
util living area													
	0.9076	0.8893	0.8555	0.7783	0.6637	0.5085	0.4012	0.4240	0.6138	0.7911	0.8761	0.9127	(86)
Living	19.4724	19.6531	19.9361	20.3878	20.7157	20.9144	20.9692	20.9630	20.8310	20.4375	19.9418	19.4757	
Non living	18.8674	19.0462	19.3204	19.7636	20.0604	20.2457	20.2936	20.2899	20.1808	19.8160	19.3425	18.8828	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.2185	19.6531	19.9361	20.3878	20.7157	20.9144	20.9692	20.9630	20.8310	20.4375	19.9418	19.6889	(87)
Th 2	20.2656	20.2697	20.2697	20.2858	20.2818	20.3020	20.3102	20.3102	20.3020	20.2858	20.2858	20.2818	(88)
util rest of house													
	0.8980	0.8780	0.8404	0.7549	0.6271	0.4584	0.3429	0.3646	0.5678	0.7648	0.8618	0.9037	(89)
MIT 2	19.5503	19.0462	19.3204	19.7636	20.0604	20.2457	20.2936	20.2899	20.1808	19.8160	19.3425	19.0785	(90)
Living area fraction										fLA = Living area / (4) =		0.3196	(91)
MIT	19.7639	19.2402	19.5172	19.9631	20.2698	20.4594	20.5095	20.5050	20.3886	20.0147	19.5340	19.2736	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7639	19.2402	19.5172	19.9631	20.2698	20.4594	20.5095	20.5050	20.3886	20.0147	19.5340	19.2736	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8908	0.8595	0.8230	0.7434	0.6265	0.4700	0.3600	0.3818	0.5738	0.7539	0.8447	0.8890	(94)
Useful gains	611.0418	616.8058	614.7283	569.7172	478.5917	347.8123	254.3424	259.2418	381.4628	485.8323	544.2386	591.8804	(95)
Ext temp.	4.7000	5.3000	6.7000	9.3000	12.3000	15.0000	16.6000	16.5000	14.1000	10.8000	7.5000	4.6000	(96)
Heat loss rate W													
	1076.7501	990.5516	910.7546	739.7053	556.2338	369.5173	261.3146	267.6971	425.6384	639.2266	834.8081	1024.1033	(97)
Space heating kWh													
	346.4870	251.1572	220.2435	122.3914	57.7657	0.0000	0.0000	0.0000	0.0000	114.1253	209.2101	321.5739	(98a)
Space heating requirement - total per year (kWh/year)												1642.9541	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	346.4870	251.1572	220.2435	122.3914	57.7657	0.0000	0.0000	0.0000	0.0000	114.1253	209.2101	321.5739	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1642.9541	
Space heating per m2											(98c) / (4) =	18.0624	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)

Efficiency of main space heating system 1 (in %)												269.7489	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	346.4870	251.1572	220.2435	122.3914	57.7657	0.0000	0.0000	0.0000	0.0000	114.1253	209.2101	321.5739	(98)
Space heating efficiency (main heating system 1)													
	269.7489	269.7489	269.7489	269.7489	269.7489	0.0000	0.0000	0.0000	0.0000	269.7489	269.7489	269.7489	(210)
Space heating fuel (main heating system)													
	128.4480	93.1078	81.6476	45.3723	21.4146	0.0000	0.0000	0.0000	0.0000	42.3080	77.5573	119.2123	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	270.9257	239.5518	254.2233	222.7027	215.3659	193.4882	190.4619	198.2911	200.7776	224.5893	239.6993	267.8447	(64)
Efficiency of water heater												281.4160	(216)
(217)m	281.4160	281.4160	281.4160	281.4160	281.4160	281.4160	281.4160	281.4160	281.4160	281.4160	281.4160	281.4160	(217)
Fuel for water heating, kWh/month													
	96.2723	85.1237	90.3372	79.1365	76.5294	68.7552	67.6798	70.4619	71.3455	79.8069	85.1761	95.1775	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	29.6563	26.7864	29.6563	28.6997	29.6563	28.6997	29.6563	29.6563	28.6997	29.6563	28.6997	29.6563	(231)
Lighting	30.8703	24.7653	22.2984	16.3368	12.6190	10.3098	11.5115	14.9631	19.4355	25.5005	28.8027	31.7283	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												609.0679	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												281.4160	
Water heating fuel used												965.8020	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.1900)													
mechanical ventilation fans (SFP = 1.1900)												349.1794	(230a)
Total electricity for the above, kWh/year												349.1794	(231)
Electricity for lighting (calculated in Appendix L)												249.1413	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												2173.1906	(238)

10a. Fuel costs - using BEDF prices (583)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	609.0679	28.4300	173.1580	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	965.8020	28.4300	274.5775	(247)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(247a)
Pumps, fans and electric keep-hot	349.1794	28.4300	99.2717	(249)
Energy for lighting	249.1413	28.4300	70.8309	(250)
Additional standing charges			0.0000	(251)
Total energy cost			617.8381	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	609.0679	0.1552	94.5380	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	965.8020	0.1410	136.1404	(264)
Space and water heating			230.6784	(265)
Pumps, fans and electric keep-hot	349.1794	0.1387	48.4355	(267)
Energy for lighting	249.1413	0.1443	35.9588	(268)
Total CO2, kg/year			315.0726	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	609.0679	1.5746	959.0631	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	965.8020	1.5212	1469.2027	(278)
Space and water heating			2428.2658	(279)

Pumps, fans and electric keep-hot	349.1794	1.5128	528.2386 (281)
Energy for lighting	249.1413	1.5338	382.1413 (282)
Total Primary energy kWh/year			3338.6457 (286)

SAP 10 EPC IMPROVEMENTS

001

Current energy efficiency rating: B 84
Current environmental impact rating: A 97

N Solar water heating		Recommended
U Solar photovoltaic panels		Recommended
V2 Wind turbine		Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
N Solar water heating	+ 1.4	-£ 53	-23 kg (7.2%)
U Solar photovoltaic panels	+ 8.2	-£ 277	-207 kg (70.8%)

	Typical annual savings		Energy efficiency	Environmental impact
Recommended measures				
Solar water heating	£53	0.25 kg/m²	B 86	A 97
Solar photovoltaic panels	£277	2.27 kg/m²	A 94	A 99
Total Savings	£330	2.52 kg/m²		

Potential energy efficiency rating: A 94
Potential environmental impact rating: A 99

Fuel prices for cost data on this page from database revision number 583 TEST (01 Oct 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, West Pennines (England)):

	Current	Potential	Saving
Electricity	£618	£565	£53
Space heating	£272	£298	-£26
Water heating	£275	£196	£78
Lighting	£71	£71	£0
Generated (PV)	-£0	-£277	£277
Total cost of fuels	£618	£288	£330
Total cost of uses	£618	£288	£329
Delivered energy	24 kWh/m²	4 kWh/m²	20 kWh/m²
Carbon dioxide emissions	0.3 tonnes	0.1 tonnes	0.2 tonnes
CO2 emissions per m²	3 kg/m²	1 kg/m²	3 kg/m²
Primary energy	37 kWh/m²	16 kWh/m²	20 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	41.1800	(1b)	x 2.4800	(2b) =	102.1264	(1b) - (3b)
First floor	49.7800	(1c)	x 2.7800	(2c) =	138.3884	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	90.9600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		240.5148	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.2500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2125	(21)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													
	0.2709	0.2656	0.2603	0.2338	0.2284	0.2019	0.2019	0.1966	0.2125	0.2284	0.2391	0.2497	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	81.0000	(23c)

Effective ac	0.3659	0.3606	0.3553	0.3287	0.3234	0.2969	0.2969	0.2916	0.3075	0.3234	0.3341	0.3447	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Door			4.1400	1.0000	4.1400			(26)
Window			8.5100	0.7752	6.5969			(27)
GF			41.1800	0.0800	3.2944	75.0000	3088.5000	(28a)
Exposed Floor			8.6000	0.1400	1.2040	20.0000	172.0000	(28b)
Main	64.8536	12.6500	52.2036	0.1300	6.7865	9.0000	469.8324	(29a)
PIJ	49.7800		49.7800	0.1300	6.4714	9.0000	448.0200	(30)
Total net area of external elements Aum(A, m2)			164.4136					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	28.4932			(33)
Main dwelling								
Party Wall 1			88.2100	0.0000	0.0000	20.0000	1764.2000	(32)
Timber			96.4800			9.0000	868.3200	(32c)
FF			41.1800			18.0000	741.2400	(32d)
GF			41.1800			9.0000	370.6200	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 7922.7324	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	87.1013	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	8.6300	0.1150	0.9925
E3 Sill	8.6300	0.0170	0.1467
E4 Jamb	28.2000	0.0940	2.6508
E5 Ground floor (normal)	13.8200	0.0670	0.9259
E16 Corner (normal)	4.9600	0.0680	0.3373
E12 Gable (insulation at ceiling level)	11.0000	0.0770	0.8470
E6 Intermediate floor within a dwelling	11.0000	0.0320	0.3520
E17 Corner (inverted - internal area greater than external area)	4.9600	-0.0290	-0.1438
P1 Party wall - Ground floor	15.2800	0.3200	4.8896
E20 Exposed floor (normal)	6.4400	0.0790	0.5088
E21 Exposed floor (inverted)	12.0800	0.0630	0.7610
E18 Party wall between dwellings	21.0400	0.0920	1.9357
P4 Party wall - Roof (insulation at ceiling level)	18.1000	0.1020	1.8462

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		16.0496 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	44.5428 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	29.0444	28.6228	28.2011	26.0928	25.6712	23.5629	23.5629	23.1413	24.4062	25.6712	26.5145	27.3578	(38)
Heat transfer coeff													
	73.5872	73.1656	72.7439	70.6356	70.2140	68.1057	68.1057	67.6841	68.9490	70.2140	71.0573	71.9006	(39)
Average = Sum(39)m / 12 =												70.5302	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8090	0.8044	0.7997	0.7766	0.7719	0.7487	0.7487	0.7441	0.7580	0.7719	0.7812	0.7905	(40)
HLP (average)												0.7754	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.6386	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
68.4610	67.4321	65.9329	63.0644	60.9476	58.5869	57.2450	58.7329	60.3639	62.8986	65.8287	68.1987	(42a)

Hot water usage for baths

29.5637	29.1246	28.5063	27.3663	26.5127	25.5661	25.0549	25.6688	26.3373	27.3502	28.5137	29.4637	(42b)

Hot water usage for other uses

41.6522	40.1376	38.6230	37.1084	35.5937	34.0791	34.0791	35.5937	37.1084	38.6230	40.1376	41.6522	(42c)

Average daily hot water use (litres/day)	128.3946	(43)

Daily hot water use

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
139.6769	136.6944	133.0622	127.5391	123.0540	118.2321	116.3790	119.9955	123.8096	128.8717	134.4799	139.3147	(44)
Energy conte 221.2141	194.6510	204.5117	174.5947	165.6543	145.3802	140.7503	148.5795	152.6696	174.8777	191.5913	218.1331	(45)

Energy content (annual) Total = Sum(45)m =	2132.6075	
Distribution loss (46)m = 0.15 x (45)m		
33.1821 29.1976 30.6768 26.1892 24.8482 21.8070 21.1126 22.2869 22.9004 26.2317 28.7387 32.7200		(46)
Water storage loss:		
Store volume	210.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):	1.5800	(48)
Temperature factor from Table 2b	0.5400	(49)
Enter (49) or (54) in (55)	0.8532	(55)
Total storage loss		
26.4492 23.8896 26.4492 25.5960 26.4492 25.5960 26.4492 26.4492 25.5960 26.4492 25.5960 26.4492		(56)
If cylinder contains dedicated solar storage		
17.0031 15.3576 17.0031 16.4546 17.0031 16.4546 17.0031 17.0031 16.4546 17.0031 16.4546 17.0031		(57)
Primary loss 23.2624 21.0112 21.8667 15.7584 10.4681 9.9053 10.2355 11.1660 17.1091 21.8667 22.5120 23.2624		(59)
Combi loss 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000		(61)
Total heat required for water heating calculated for each month		
261.4795 231.0198 243.3814 206.8077 193.1255 171.7400 167.9889 176.7485 186.2333 213.7474 230.5579 258.3985		(62)
WWHRS 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000		(63a)
PV diverter -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000		(63b)
Aperture area of solar collector	3.0000	(H1)
Zero-loss collector efficiency	0.8000	(H2)
Collector linear heat loss coefficient	1.8000	(H3)
Collector 2nd order heat loss coefficient	0.0000	(H4)
Collector loop efficiency	0.9000	(H5)
Incidence angle modifier	1.0000	(H6)
Overshading factor	0.8000	(H8)
Overall heat loss coefficient of system	6.5000	(H10)
Heat loss coefficient of collector loop	3.9667	(H11)

Dedicated solar storage volume												75.0000	(H12)
If combined cylinder, total volume of cylinder												210.0000	(H13)
Effective solar volume												115.5000	(H14)
Reference volume												225.0000	(H15)
Storage tank correction coefficient												1.1814	(H16)
Heat delivered to hot water												654.6757	(H24)
Heat delivered to space heating												0.0000	(H29)
Solar input												654.6757	
Solar input	-0.0000	-20.1906	-62.4438	-83.8682	-107.6151	-99.0457	-98.2732	-86.8675	-61.6791	-33.2791	-1.4133	-0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	261.4795	210.8291	180.9377	122.9394	85.5104	72.6943	69.7156	89.8809	124.5542	180.4683	229.1446	258.3985	(64)
									Total per year (kWh/year) = Sum(64)m =			1886.5527	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month													
	105.7660	93.8165	99.0959	83.8231	77.0570	69.4268	68.5903	71.9379	77.6136	89.2426	94.8774	104.7416	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	35.2685	31.3252	25.4754	19.2865	14.4169	12.1713	13.1516	17.0949	22.9447	29.1336	34.0032	36.2488	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	359.4520	363.1820	353.7825	333.7722	308.5128	284.7725	268.9125	265.1825	274.5820	294.5923	319.8517	343.5920	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	(71)
Water heating gains (Table 5)													
	142.1587	139.6079	133.1934	116.4210	103.5712	96.4261	92.1913	96.6907	107.7967	119.9497	131.7741	140.7817	(72)
Total internal gains													
	643.1223	640.3582	618.6944	575.7228	532.7440	499.6131	480.4985	485.2112	511.5665	549.9188	591.8722	626.8656	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	4.9800	19.6403	0.3000	0.0000	0.7700	22.5938	(76)
West	3.5300	19.6403	0.3000	0.0000	0.7700	16.0153	(80)

Solar gains	38.6090	75.5274	124.3829	181.4051	222.3188	227.5828	216.6681	186.1147	144.6625	89.6197	48.1409	31.7502	(83)
Total gains	681.7313	715.8856	743.0774	757.1279	755.0628	727.1959	697.1666	671.3260	656.2290	639.5384	640.0131	658.6158	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	29.9068	30.0792	30.2535	31.1565	31.3436	32.3139	32.3139	32.5152	31.9186	31.3436	30.9716	30.6084	
alpha	2.9938	3.0053	3.0169	3.0771	3.0896	3.1543	3.1543	3.1677	3.1279	3.0896	3.0648	3.0406	
util living area													
	0.9157	0.8984	0.8640	0.7984	0.6982	0.5451	0.4122	0.4410	0.6258	0.8030	0.8876	0.9213	(86)
Living	19.3145	19.5061	19.8448	20.2926	20.6435	20.8871	20.9649	20.9562	20.8144	20.3863	19.8161	19.3108	
Non living	18.6981	18.8880	19.2203	19.6648	19.9931	20.2209	20.2792	20.2776	20.1566	19.7621	19.2087	18.7064	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.1378	19.5061	19.8448	20.2926	20.6435	20.8871	20.9649	20.9562	20.8144	20.3863	19.8161	19.5471	(87)
Th 2	20.2455	20.2495	20.2536	20.2737	20.2777	20.2980	20.2980	20.3020	20.2899	20.2777	20.2697	20.2616	(88)
util rest of house													
	0.9069	0.8878	0.8496	0.7766	0.6646	0.4966	0.3518	0.3807	0.5791	0.7779	0.8746	0.9131	(89)
MIT 2	19.4539	18.8880	19.2203	19.6648	19.9931	20.2209	20.2792	20.2776	20.1566	19.7621	19.2087	18.9240	(90)
Living area fraction										fLA = Living area / (4) =		0.3196	(91)
MIT	19.6725	19.0856	19.4199	19.8655	20.2010	20.4338	20.4983	20.4945	20.3668	19.9616	19.4028	19.1231	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6725	19.0856	19.4199	19.8655	20.2010	20.4338	20.4983	20.4945	20.3668	19.9616	19.4028	19.1231	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8995	0.8687	0.8313	0.7632	0.6608	0.5063	0.3694	0.3977	0.5844	0.7657	0.8566	0.8983	(94)
Useful gains	613.1837	621.9176	617.6904	577.8741	498.9600	368.1690	257.5291	267.0090	383.4943	489.7138	548.2439	591.6221	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1131.2183	1037.8938	939.8427	774.5522	596.8894	397.3137	265.4963	277.1319	432.0910	657.3130	874.2039	1072.9796	(97)
Space heating kWh													
	385.4178	279.5360	239.6813	141.6082	72.8594	0.0000	0.0000	0.0000	0.0000	124.6938	234.6911	358.1300	(98a)
Space heating requirement - total per year (kWh/year)												1836.6177	
Solar heating kWh													
	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	385.4178	279.5360	239.6813	141.6082	72.8594	0.0000	0.0000	0.0000	0.0000	124.6938	234.6911	358.1300	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1836.6177	
Space heating per m2											(98c) / (4) =	20.1915	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												270.7081	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	385.4178	279.5360	239.6813	141.6082	72.8594	0.0000	0.0000	0.0000	0.0000	124.6938	234.6911	358.1300	(98)
Space heating efficiency (main heating system 1)													
	270.7081	270.7081	270.7081	270.7081	270.7081	0.0000	0.0000	0.0000	0.0000	270.7081	270.7081	270.7081	(210)
Space heating fuel (main heating system)													
	142.3739	103.2610	88.5386	52.3103	26.9144	0.0000	0.0000	0.0000	0.0000	46.0621	86.6953	132.2938	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	261.4795	210.8291	180.9377	122.9394	85.5104	72.6943	69.7156	89.8809	124.5542	180.4683	229.1446	258.3985	(64)
Efficiency of water heater												281.1060	(216)
(217)m	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	281.1060	(217)
Fuel for water heating, kWh/month													
	93.0181	74.9999	64.3663	43.7342	30.4193	25.8601	24.8005	31.9740	44.3086	64.1994	81.5154	91.9221	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	36.4509	32.9233	36.4509	35.2750	36.4509	35.2750	36.4509	36.4509	35.2750	36.4509	35.2750	36.4509	(231)
Lighting	30.8703	24.7653	22.2984	16.3368	12.6190	10.3098	11.5115	14.9631	19.4355	25.5005	28.8027	31.7283	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-37.4126	-55.2815	-82.5768	-94.8457	-102.3112	-93.2996	-92.1870	-86.5589	-76.2048	-63.7088	-41.7331	-31.9441	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-12.6739	-28.2985	-59.7695	-95.9263	-133.3716	-138.4141	-136.4645	-113.2151	-80.2583	-43.1370	-17.6767	-9.9697	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	678.4495	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	281.1060	
Water heating fuel used	671.1179	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.1900)		
mechanical ventilation fans (SFP = 1.1900)	349.1794	(230a)
pump for solar water heating	80.0000	(230g)
Total electricity for the above, kWh/year	429.1794	(231)
Electricity for lighting (calculated in Appendix L)	249.1413	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1727.2394	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	300.6487	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	678.4495	16.4900	111.8763	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	671.1179	16.4900	110.6673	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	349.1794	16.4900	57.5797	(249)
Pump for solar water heating	80.0000	16.4900	13.1920	(249)
Energy for lighting	249.1413	16.4900	41.0834	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-858.0643	16.4900	-141.4948	
PV Unit electricity exported	-869.1751	5.5900	-48.5869	
Total			-190.0817	(252)
Total energy cost			144.3171	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.3821	(257)
SAP value		93.8057	
SAP rating (Section 12)		94	(258)
SAP band		A	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	678.4495	0.1551	105.2275	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	671.1179	0.1462	98.1454	(264)
Space and water heating			203.3729	(265)
Pumps, fans and electric keep-hot	429.1794	0.1387	59.5325	(267)
Energy for lighting	249.1413	0.1443	35.9588	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-858.0643	0.1343	-115.2389	
PV Unit electricity exported	-869.1751	0.1239	-107.6905	
Total			-222.9293	(269)
Total CO2, kg/year			75.9348	(272)
CO2 emissions per m2			0.8300	(273)
EI value			99.2516	
EI rating			99	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	41.1800	(1b) x	2.4800	(2b) =	102.1264	(1b) - (3b)
First floor	49.7800	(1c) x	2.7800	(2c) =	138.3884	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	90.9600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		240.5148	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.2500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2125	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.6000	4.5000	4.5000	4.1000	4.2000	3.7000	3.5000	3.5000	3.7000	4.1000	4.1000	4.2000	(22)
Wind factor	1.1500	1.1250	1.1250	1.0250	1.0500	0.9250	0.8750	0.8750	0.9250	1.0250	1.0250	1.0500	(22a)
Adj infilt rate	0.2444	0.2391	0.2391	0.2178	0.2231	0.1966	0.1859	0.1859	0.1966	0.2178	0.2178	0.2231	(22b)
Balanced mechanical ventilation with heat recovery													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												81.0000	(23c)
Effective ac	0.3394	0.3341	0.3341	0.3128	0.3181	0.2916	0.2809	0.2809	0.2916	0.3128	0.3128	0.3181	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door			4.1400	1.0000	4.1400			(26)
Window			8.5100	0.7752	6.5969			(27)
GF			41.1800	0.0800	3.2944	75.0000	3088.5000	(28a)
Exposed Floor			8.6000	0.1400	1.2040	20.0000	172.0000	(28b)
Main	64.8536	12.6500	52.2036	0.1300	6.7865	9.0000	469.8324	(29a)
PIJ	49.7800		49.7800	0.1300	6.4714	9.0000	448.0200	(30)
Total net area of external elements Aum(A, m2)			164.4136					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		28.4932			(33)
Main dwelling								
Party Wall 1			88.2100	0.0000	0.0000	20.0000	1764.2000	(32)
Timber			96.4800			9.0000	868.3200	(32c)
FF			41.1800			18.0000	741.2400	(32d)
GF			41.1800			9.0000	370.6200	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		7922.7324	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							87.1013	(35)
List of Thermal Bridges								
K1 Element				Length	Psi-value	Total		

E2 Other lintels (including other steel lintels)	8.6300	0.1150	0.9925	
E3 Sill	8.6300	0.0170	0.1467	
E4 Jamb	28.2000	0.0940	2.6508	
E5 Ground floor (normal)	13.8200	0.0670	0.9259	
E16 Corner (normal)	4.9600	0.0680	0.3373	
E12 Gable (insulation at ceiling level)	11.0000	0.0770	0.8470	
E6 Intermediate floor within a dwelling	11.0000	0.0320	0.3520	
E17 Corner (inverted - internal area greater than external area)	4.9600	-0.0290	-0.1438	
P1 Party wall - Ground floor	15.2800	0.3200	4.8896	
E20 Exposed floor (normal)	6.4400	0.0790	0.5088	
E21 Exposed floor (inverted)	12.0800	0.0630	0.7610	
E18 Party wall between dwellings	21.0400	0.0920	1.9357	
P4 Party wall - Roof (insulation at ceiling level)	18.1000	0.1020	1.8462	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 16.0496 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 44.5428 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	26.9362	26.5145	26.5145	24.8279	25.2495	23.1413	22.2980	22.2980	23.1413	24.8279	24.8279	25.2495	(38)
Heat transfer coeff	71.4789	71.0573	71.0573	69.3707	69.7923	67.6841	66.8408	66.8408	67.6841	69.3707	69.3707	69.7923	(39)

Average = Sum(39)m / 12 = 69.1950

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7858	0.7812	0.7812	0.7627	0.7673	0.7441	0.7348	0.7348	0.7441	0.7627	0.7627	0.7673	(40)
HLP (average)												0.7607	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6386 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
68.4610	67.4321	65.9329	63.0644	60.9476	58.5869	57.2450	58.7329	60.3639	62.8986	65.8287	68.1987	(42a)

Hot water usage for baths

29.5637	29.1246	28.5063	27.3663	26.5127	25.5661	25.0549	25.6688	26.3373	27.3502	28.5137	29.4637	(42b)

Hot water usage for other uses

41.6522	40.1376	38.6230	37.1084	35.5937	34.0791	34.0791	35.5937	37.1084	38.6230	40.1376	41.6522	(42c)

Average daily hot water use (litres/day) 128.3946 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	139.6769	136.6944	133.0622	127.5391	123.0540	118.2321	116.3790	119.9955	123.8096	128.8717	134.4799	139.3147	(44)
Energy conte	221.2141	194.6510	204.5117	174.5947	165.6543	145.3802	140.7503	148.5795	152.6696	174.8777	191.5913	218.1331	(45)
Energy content (annual)										Total = Sum(45)m =		2132.6075	
Distribution loss (46)m = 0.15 x (45)m	33.1821	29.1976	30.6768	26.1892	24.8482	21.8070	21.1126	22.2869	22.9004	26.2317	28.7387	32.7200	(46)

Water storage loss:
Store volume 210.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.5800 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.8532 (55)
Total storage loss

26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(56)

If cylinder contains dedicated solar storage

17.0031	15.3576	17.0031	16.4546	17.0031	16.4546	17.0031	17.0031	16.4546	17.0031	16.4546	17.0031	(57)
Primary loss 23.2624	21.0112	21.8667	15.7584	10.4681	9.9053	10.2355	11.1660	17.1091	21.8667	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

261.4795	231.0198	243.3814	206.8077	193.1255	171.7400	167.9889	176.7485	186.2333	213.7474	230.5579	258.3985	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)

Aperture area of solar collector 3.0000 (H1)
Zero-loss collector efficiency 0.8000 (H2)
Collector linear heat loss coefficient 1.8000 (H3)
Collector 2nd order heat loss coefficient 0.0000 (H4)
Collector loop efficiency 0.9000 (H5)
Incidence angle modifier 1.0000 (H6)
Overshading factor 0.8000 (H8)
Overall heat loss coefficient of system 6.5000 (H10)
Heat loss coefficient of collector loop 3.9667 (H11)
Dedicated solar storage volume 75.0000 (H12)
If combined cylinder, total volume of cylinder 210.0000 (H13)
Effective solar volume 115.5000 (H14)
Reference volume 225.0000 (H15)
Storage tank correction coefficient 1.1814 (H16)
Heat delivered to hot water 599.1897 (H24)
Heat delivered to space heating 0.0000 (H29)
Solar input 599.1897

Solar input -0.0000	-14.4822	-56.8249	-79.3403	-100.2904	-94.0949	-90.8995	-78.3168	-56.9604	-27.9802	-0.0000	-0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

261.4795	216.5376	186.5565	127.4673	92.8350	77.6451	77.0894	98.4317	129.2728	185.7672	230.5579	258.3985	(64)
							Total per year (kWh/year) = Sum(64)m =				1942.0387	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
							Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =				0.0000	(64a)

Heat gains from water heating, kWh/month

105.7660	93.8165	99.0959	83.8231	77.0570	69.4268	68.5903	71.9379	77.6136	89.2426	94.8774	104.7416	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	158.3180	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	35.2685	31.3252	25.4754	19.2865	14.4169	12.1713	13.1516	17.0949	22.9447	29.1336	34.0032	36.2488	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	359.4520	363.1820	353.7825	333.7722	308.5128	284.7725	268.9125	265.1825	274.5820	294.5923	319.8517	343.5920	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	53.4704	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)	
Losses e.g. evaporation (negative values) (Table 5)	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	-105.5454	(71)
Water heating gains (Table 5)													

	142.1587	139.6079	133.1934	116.4210	103.5712	96.4261	92.1913	96.6907	107.7967	119.9497	131.7741	140.7817	(72)
Total internal gains	643.1223	640.3582	618.6944	575.7228	532.7440	499.6131	480.4985	485.2112	511.5665	549.9188	591.8722	626.8656	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	4.9800	16.6187	0.3000	0.0000	0.7700	19.1178	(76)
West	3.5300	16.6187	0.3000	0.0000	0.7700	13.5514	(80)

Solar gains	32.6692	67.1355	116.6090	172.9395	207.2659	216.2037	201.7650	170.7039	137.1149	82.8303	42.3057	28.7264	(83)
Total gains	675.7915	707.4937	735.3035	748.6623	740.0099	715.8167	682.2635	655.9152	648.6814	632.7491	634.1778	655.5920	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	30.7889	30.9716	30.9716	31.7246	31.5330	32.5152	32.9254	32.9254	32.5152	31.7246	31.7246	31.5330	
alpha	3.0526	3.0648	3.0648	3.1150	3.1022	3.1677	3.1950	3.1950	3.1677	3.1150	3.1150	3.1022	
util living area	0.9105	0.8925	0.8598	0.7866	0.6771	0.5223	0.4139	0.4372	0.6245	0.7975	0.8800	0.9156	(86)
Living	19.4520	19.6341	19.9169	20.3665	20.6987	20.9076	20.9663	20.9596	20.8224	20.4227	19.9237	19.4549	
Non living	18.8477	19.0280	19.3024	19.7444	20.0463	20.2410	20.2920	20.2879	20.1742	19.8028	19.3253	18.8626	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.2081	19.6341	19.9169	20.3665	20.6987	20.9076	20.9663	20.9596	20.8224	20.4227	19.9237	19.6710	(87)
Th 2	20.2656	20.2697	20.2697	20.2858	20.2818	20.3020	20.3102	20.3102	20.3020	20.2858	20.2858	20.2818	(88)
util rest of house	0.9012	0.8814	0.8451	0.7637	0.6407	0.4716	0.3542	0.3765	0.5784	0.7716	0.8661	0.9068	(89)
MIT 2	19.5403	19.0280	19.3024	19.7444	20.0463	20.2410	20.2920	20.2879	20.1742	19.8028	19.3253	19.0611	(90)
Living area fraction										fLA = Living area / (4) =		0.3196	(91)
MIT	19.7537	19.2217	19.4988	19.9432	20.2548	20.4541	20.5075	20.5026	20.3813	20.0009	19.5165	19.2560	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7537	19.2217	19.4988	19.9432	20.2548	20.4541	20.5075	20.5026	20.3813	20.0009	19.5165	19.2560	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8940	0.8630	0.8275	0.7517	0.6393	0.4830	0.3716	0.3938	0.5839	0.7603	0.8489	0.8923	(94)
Useful gains	604.1499	610.5443	608.4308	562.7679	473.0604	345.7264	253.5441	258.2962	378.7460	481.0579	538.3296	584.9821	(95)
Ext temp.	4.7000	5.3000	6.7000	9.3000	12.3000	15.0000	16.6000	16.5000	14.1000	10.8000	7.5000	4.6000	(96)
Heat loss rate W	1076.0231	989.2387	909.4455	738.3266	555.1862	369.1525	261.1787	267.5356	425.1462	638.2757	833.5944	1022.8793	(97)
Space heating kWh	351.0737	254.4826	223.9550	126.4022	61.1016	0.0000	0.0000	0.0000	0.0000	116.9700	212.5906	325.7955	(98a)
Space heating requirement - total per year (kWh/year)												1672.3713	
Solar heating kWh	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	351.0737	254.4826	223.9550	126.4022	61.1016	0.0000	0.0000	0.0000	0.0000	116.9700	212.5906	325.7955	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1672.3713	
Space heating per m2											(98c) / (4) =	18.3858	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												269.7489	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	351.0737	254.4826	223.9550	126.4022	61.1016	0.0000	0.0000	0.0000	0.0000	116.9700	212.5906	325.7955	(98)
Space heating efficiency (main heating system 1)	269.7489	269.7489	269.7489	269.7489	269.7489	0.0000	0.0000	0.0000	0.0000	269.7489	269.7489	269.7489	(210)
Space heating fuel (main heating system)	130.1483	94.3406	83.0235	46.8592	22.6513	0.0000	0.0000	0.0000	0.0000	43.3626	78.8106	120.7773	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	261.4795	216.5376	186.5565	127.4673	92.8350	77.6451	77.0894	98.4317	129.2728	185.7672	230.5579	258.3985	(64)
Efficiency of water heater												281.4160	(216)
(217)m	281.4160	281.4160	281.4160	281.4160	281.4160	281.4160	281.4160	281.4160	281.4160	281.4160	281.4160	281.4160	(217)
Fuel for water heating, kWh/month	92.9156	76.9457	66.2921	45.2950	32.9885	27.5909	27.3934	34.9773	45.9366	66.0116	81.9278	91.8208	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	36.4509	32.9233	36.4509	35.2750	36.4509	35.2750	36.4509	36.4509	35.2750	36.4509	35.2750	36.4509	(231)
Lighting	30.8703	24.7653	22.2984	16.3368	12.6190	10.3098	11.5115	14.9631	19.4355	25.5005	28.8027	31.7283	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-32.3272	-50.1980	-78.6403	-91.6477	-98.0326	-90.9865	-89.0327	-82.6495	-73.7822	-60.0630	-37.4118	-29.2154	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)

Electricity generated by PVs (Appendix M) (negative quantity)

(233b)m	-10.0537	-24.0953	-54.8093	-90.2216	-121.6925	-129.1415	-123.8914	-100.5827	-74.5176	-38.6885	-14.7968	-8.7066	(233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	619.9733	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	281.4160	
Water heating fuel used	690.0953	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.1900)		
mechanical ventilation fans (SFP = 1.1900)	349.1794	(230a)
pump for solar water heating	80.0000	(230g)
Total electricity for the above, kWh/year	429.1794	(231)
Electricity for lighting (calculated in Appendix L)	249.1413	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1605.1846	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	383.2047	(238)

10a. Fuel costs - using BEDF prices (583)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	619.9733	28.4300	176.2584	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	690.0953	28.4300	196.1941	(247)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(247a)
Pumps, fans and electric keep-hot	349.1794	28.4300	99.2717	(249)
Pump for solar water heating	80.0000	28.4300	22.7440	(249)
Energy for lighting	249.1413	28.4300	70.8309	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-813.9870	28.4300	-231.4165	
PV Unit electricity exported	-791.1976	5.8100	-45.9686	
Total			-277.3851	(252)
Total energy cost			287.9140	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	619.9733	0.1551	96.1865	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	690.0953	0.1458	100.6197	(264)
Space and water heating			196.8062	(265)
Pumps, fans and electric keep-hot	429.1794	0.1387	59.5325	(267)
Energy for lighting	249.1413	0.1443	35.9588	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-813.9870	0.1339	-109.0180	
PV Unit electricity exported	-791.1976	0.1237	-97.8355	
Total			-206.8535	(269)
Total CO2, kg/year			85.4440	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	619.9733	1.5744	976.0710	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	690.0953	1.5394	1062.3003	(278)
Space and water heating			2038.3713	(279)
Pumps, fans and electric keep-hot	429.1794	1.5128	649.2626	(281)
Energy for lighting	249.1413	1.5338	382.1413	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-813.9870	1.4950	-1216.8829	
PV Unit electricity exported	-791.1976	0.4538	-359.0721	
Total			-1575.9549	(283)
Total Primary energy kWh/year			1493.8202	(286)

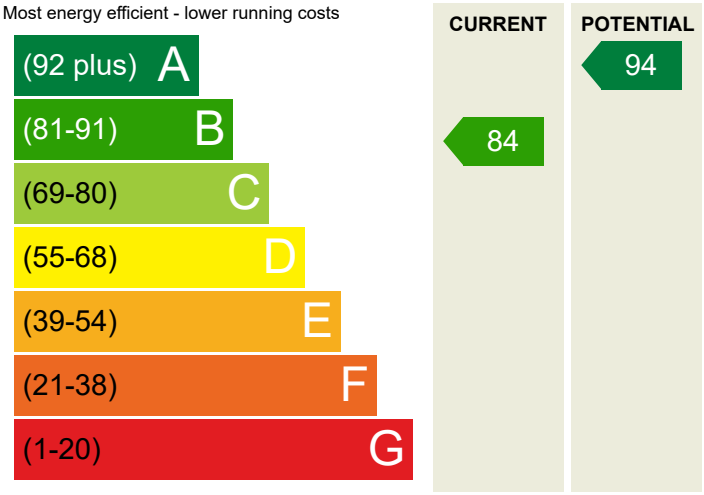
Energy Report

Dwelling Address	822 Rochdale Road, MANCHESTER, M9 8FA
Reference	78449-17-001
Assessment Date	02/07/2025
Submission Date	
Property Type	House, Mid-Terrace
Total Floor Area	91

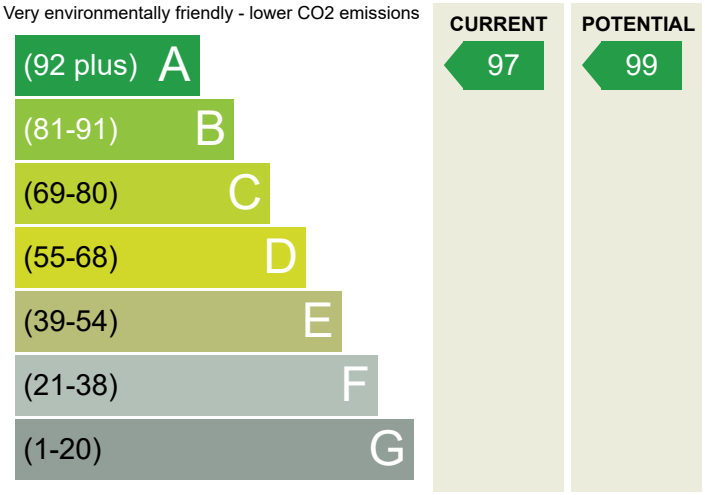
This Energy Report has been generated using the UK's National Calculation Methodology for dwellings, Standard Assessment Procedure (SAP). This methodology is used to assess the energy efficiency of dwellings which is calculated based on a dwelling's heating, hot water, ventilation and lighting usage.

This document is not an Energy Performance Certificate (EPC) as required by the Energy Performance of Buildings Regulations

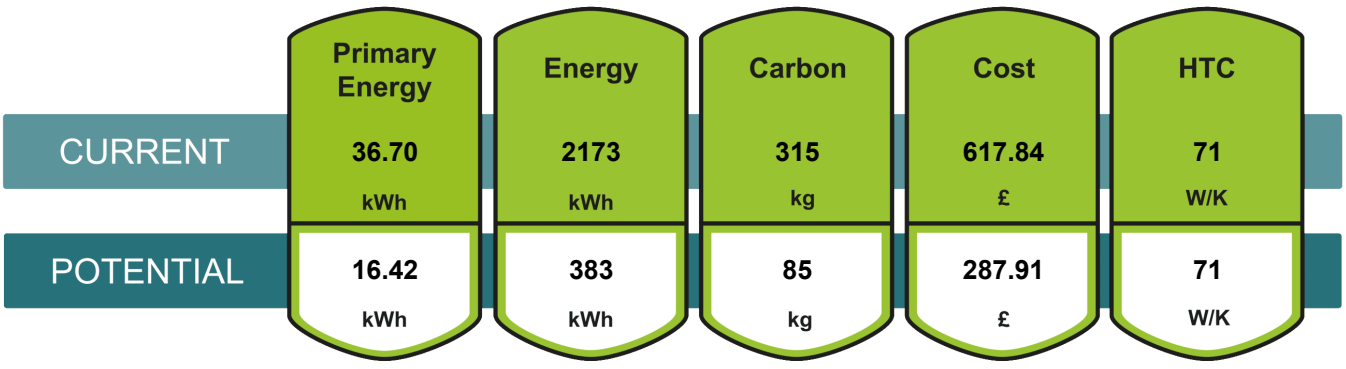
Energy Efficiency Rating



Carbon Dioxide (CO2) Emissions Rating



Additional ratings for your home



Energy Report

Breakdown of property's energy performance

Each feature is assessed as one of the following:

Very Poor | Poor | Average | Good | Very Good

Feature	Description	Energy Performance
Walls	Average thermal transmittance 0.13 W/m²K	Very Good
Roof	Average thermal transmittance 0.13 W/m²K	Very Good
Floor	Average thermal transmittance 0.09 W/m²K	Very Good
Windows	High performance glazing	Very Good
Main heating	Air source heat pump, radiators, electric	Good
Main heating controls	Programmer, room thermostat and TRVs	Good
Secondary heating	None	
Hot water	From main system	Good
Lighting	Good lighting efficiency	Good
Air tightness	Air permeability [AP50] = 5.0 m³/h.m² (as tested)	Good

Recommendations

The recommended measures provided below will help to improve the energy efficiency of the dwelling.
To reach the dwelling's potential energy rating all of the recommended measures shown below would need to be installed.
Having these measures installed individually or in any other order may give a different result when compared with the cumulative potential rating.

Recommended measures	Cumulative savings (per year)	Cumulative rating	Typical costs	Incremental savings (per year)	Cumulative CO2 rating
Solar water heating	£53	B 86	£4,000 - £7,000	£53	A 97
Photovoltaic	£330	A 94	£8,000 - £10,000	£277	A 99

Energy Report

The typical cost is based on average installation prices across the country so may not be representative of the actual costs in your area.

Estimated energy costs of the dwelling

The table below shows the estimated running costs of the space and water heating and lighting within the dwelling. It does not include the energy used from household appliances. The estimated annual costs after potential improvements indicates the total energy cost if all recommended measures named above were installed.

	Estimated annual costs	Estimated annual costs after potential improvements	Potential future savings
Lighting	£71	£71	
Heating	£272	£298	
Hot Water	£275	£196	
New Technologies e.g. Impact of PV	£0	-(£277)	
TOTAL	£618	£288	

Estimated energy use and potential savings

Space Heating
609
kWh per year

Water Heating
966
kWh per year

Energy Report

About this document

Created by:	
Company/Trading name:	
Phone number:	
Email address:	

Disclaimer

This Energy Report should not under any circumstances be treated as a Condition Survey and cannot be used to indicate that any element of the dwelling (e.g.heating system) is working correctly.
This Energy Report must not be used in situations where an Energy Performance Certificate (EPC) is required.
This Energy Report is generated from a set of data inputs which may not reflect the actual dimensions, services or construction of the dwelling.
The calculation used to generate this report reflects the SAP Methodology current at the time of report generation.

Glossary terms for additional metrics

Primary Energy	The measure of the energy required for lighting, heating and hot water in a property. This includes the efficiency of the property's heating system, power station efficiency for electricity and the energy used to produce the fuel and deliver it to the property.
Energy Used	The estimated amount of fuel energy for lighting, heating and hot water for the property. The estimate is based on typical usage which is likely to be different to actual consumption.
Carbon (CO2)	The current emissions based on the energy estimates.
Cost	The estimated cost of energy. The cost of each unit of fuel is based on an industry standard which is likely to be different to those the occupier actually pays.
Heat Transfer Coefficient	Heat flow through the property envelope where internal and external temperatures are different.

Building Regulations England Part L (BREL) Compliance Report

Approved Document L1 2021 Edition, England assessed by Array SAP 10 program, Array

Date: Fri 03 Oct 2025 15:03:29

Project Information			
Assessed By	Paul Goddard	Building Type	House, End-terrace
OCDEA Registration	EES/005113	Assessment Date	2025-10-03

Dwelling Details			
Assessment Type	As built	Total Floor Area	120 m^2
Site Reference	78449-18	Plot Reference	001
Address	820 Rochdale Road, MANCHESTER, M9 8FA		

Client Details	
Name	-
Company	John Southworth
Address	Unit 10, Charles Street, DUKINFIELD, SK16 4SD

This report covers items included within the SAP calculations. It is not a complete report of regulations compliance.

1a Target emission rate and dwelling emission rate		
Fuel for main heating system	Electricity	
Target carbon dioxide emission rate	*10.76 $kgCO_2/m^2$*	
Dwelling carbon dioxide emission rate	3.33 $kgCO_2/m^2$	OK
1b Target primary energy rate and dwelling primary energy		
Target primary energy	*56.43 kWh_{PE}/m^2*	
Dwelling primary energy	35.22 kWh_{PE}/m^2	OK
1c Target fabric energy efficiency and dwelling fabric energy efficiency		
Target fabric energy efficiency	*38.5 kWh/m^2*	
Dwelling fabric energy efficiency	33.4 kWh/m^2	OK

2a Fabric U-values				
Element	***Maximum permitted average U-Value [W/m^2K]***	**Dwelling average U-Value [W/m^2K]**	**Element with highest individual U-Value**	
External walls	*0.26*	0.13	Walls (1) (0.13)	OK
Party walls	*0.2*	0	Party Wall (1) (0)	**N/A**
Curtain walls	*1.6*	0	N/A	**N/A**
Floors	*0.18*	0.09	Exposed Floor (0.14)	OK
Roofs	*0.16*	0.11	Roof (1) (0.13)	OK
Windows, doors, and roof windows	*1.6*	0.85	Front (1)	OK
Rooflights	*2.2*	N/A	N/A	**N/A**

2b Envelope elements (better than typically expected values are flagged with a subsequent (!))		
Name	**Net area [m^2]**	**U-Value [W/m^2K]**
Exposed wall: Walls (1)	120.97	0.13 **(!)**
Exposed wall: Walls (2)	16.77	0.09 **(!)**
Party wall: Party Wall (1)	40.63	0 **(!)**
Ground floor: GF, GF	47.06	0.09 **(!)**
Upper floor: Exposed Floor, Exposed Floor	2.72	0.14
Exposed roof: Roof (1)	15.51	0.13
Exposed roof: Roof (2)	12.23	0.13
Exposed roof: Roof (3)	26.38	0.09 **(!)**

2c Openings (better than typically expected values are flagged with a subsequent (!))				
Name	**Area [m^2]**	**Orientation**	**Frame factor**	**U-Value [W/m^2K]**
Front, Door	1.99	East	N/A	1 **(!)**
Front, Window	5.8	East	1.0	0.8 **(!)**
Rear, Window	2.81	West	1.0	0.8 **(!)**
Rear, Door	2.15	West	N/A	1 **(!)**
Side, Window	2.36	South	1.0	0.8 **(!)**

2d Thermal bridging (better than typically expected values are flagged with a subsequent (!))
Building part **1**: Thermal bridging calculated from linear thermal transmittances for each junction

Main element	Junction detail	Source	Psi value [W/mK]	Drawing / reference
External wall	E2: Other lintels (including other steel lintels)	Calculated by person with suitable expertise	0.115	Thermal Bridge Report
External wall	E3: Sill	Calculated by person with suitable expertise	0.017 **(!)**	Thermal Bridge Report
External wall	E4: Jamb	Calculated by person with suitable expertise	0.094	Thermal Bridge Report
External wall	E5: Ground floor (normal)	Calculated by person with suitable expertise	0.067	Thermal Bridge Report
External wall	E11: Eaves (insulation at rafter level)	Calculated by person with suitable expertise	0.025 **(!)**	Thermal Bridge Report
External wall	E16: Corner (normal)	Calculated by person with suitable expertise	0.068	Thermal Bridge Report
External wall	E12: Gable (insulation at ceiling level)	Calculated by person with suitable expertise	0.077	Thermal Bridge Report
External wall	E6: Intermediate floor within a dwelling	Calculated by person with suitable expertise	0.032 **(!)**	Thermal Bridge Report
External wall	E17: Corner (inverted - internal area greater than external area)	Calculated by person with suitable expertise	-0.029 **(!)**	Thermal Bridge Report
Party wall	P1: Ground floor	SAP table default	0.32	K1
External wall	E20: Exposed floor (normal)	Calculated by person with suitable expertise	0.079	Thermal Bridge Report
External wall	E21: Exposed floor (inverted)	Calculated by person with suitable expertise	0.063	Thermal Bridge Report
External wall	E13: Gable (insulation at rafter level)	Calculated by person with suitable expertise	0.074	Thermal Bridge Report
External wall	E18: Party wall between dwellings	Calculated by person with suitable expertise	0.092	Thermal Bridge Report
Roof	R6: Flat ceiling	Calculated by person with suitable expertise	-0.043	Thermal Bridge Report
External wall	E25: Staggered party wall between dwellings	Calculated by person with suitable expertise	0.056	Thermal Bridge Report

3 Air permeability (better than typically expected values are flagged with a subsequent (!))		
Maximum permitted air permeability at 50Pa	*8 m^3/hm^2*	
Dwelling air permeability at 50Pa	5 m^3/hm^2, Measured value	OK
Air permeability test certificate reference		

4 Space heating	
Main heating system 1: Heat pump with radiators or underfloor heating - Electricity	
Efficiency	281.4%
Emitter type	Radiators
Flow temperature	45°C
System type	
Manufacturer	Daikin Europe NV
Model	EDLA09DA3V3
Commissioning	
Secondary heating system: N/A	
Fuel	N/A
Efficiency	N/A
Commissioning	

5 Hot water	
Cylinder/store - type: Cylinder	
Capacity	210 litres
Declared heat loss	1.58 kWh/day
Primary pipework insulated	Yes
Manufacturer	
Model	
Commissioning	
Waste water heat recovery system 1 - type: N/A	
Efficiency	
Manufacturer	
Model	

6 Controls		
Main heating 1 - type: Programmer, room thermostat and TRVs		
Function		
Ecodesign class		
Manufacturer		
Model		
Water heating - type: Cylinder thermostat and HW separately timed		
Manufacturer		
Model		

7 Lighting		
Minimum permitted light source efficacy	*75 lm/W*	
Lowest light source efficacy	80 lm/W	OK
External lights control	N/A	

8 Mechanical ventilation		
System type: Balanced whole-house mechanical ventilation with heat recovery		
Maximum permitted specific fan power	*1.5 W/(l/s)*	
Specific fan power	0.97 W/(l/s)	OK
Minimum permitted heat recovery efficiency	*73%*	
Heat recovery efficiency	89%	OK
Manufacturer/Model	DV110 Adroit	
Commissioning		

9 Local generation
N/A

10 Heat networks
N/A

11 Supporting documentary evidence	
Documentary evidence identified in 11.1 and 11.2 is needed to confirm the data values used for any calculations undertaken, manufacturer declarations made, and tests performed as reflected in this "As built" BREL Compliance Report are correct. 11.1 SAP Conventions, Appendix 1 (documentary evidence) schedules the minimum documentary evidence required. 11.2 Indicative photographic evidence of key stages during construction (guidance within Approved Document L, Volume 1 – Appendix B) that confirms the products identified in this BREL Compliance Report are used in this dwelling, and workmanship is of sufficient quality to support the calculated values claimed in 2a to 2d.	

12 Declarations	
a. Assessor Declaration	
This declaration by the assessor is confirmation that the contents of this BREL Compliance Report are a true and accurate reflection based upon the design and construction information submitted for this dwelling for the purpose of carrying out the assessment, and that the supporting documentary evidence (identified in 11.1 and 11.2) pursuant to Part L of the Building Regulations 2010 (as amended) has been reviewed in the course of preparing this BREL Compliance Report.	
Signed: Name:	Assessor ID: Date:
b. Client Declaration	
This declaration by the client is confirmation that the dwelling has been constructed and completed according to the specifications set out in this BREL Compliance Report, and that photographic evidence of key stages, as described in 11.2, has been provided to the Assessor for this dwelling.	
Signed: Name:	Organisation: Date:

Full SAP Calculation Printout

Property Reference	78449-18	**Issued on Date**	03/10/2025
Assessment Reference	001	**Prop Type Ref**	End
Property	820 Rochdale Road, MANCHESTER, M9 8FA		

SAP Rating	84 B	**DER**	3.33	**TER**	10.76
Environmental	97 A	**% DER < TER**			69.05
CO_2 Emissions (t/year)	0.38	**DFEE**	33.44	**TFEE**	38.50
Compliance Check	See BREL	**% DFEE < TFEE**			13.15
% DPER < TPER	37.58	**DPER**	35.22	**TPER**	56.43

Assessor Details	Mr. Daniel Goddard	**Assessor ID**	CP52-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.0600 (1b)	x	2.4800 (2b)	=	116.7088	(1b) - (3b)
First floor	49.7800 (1c)	x	2.7800 (2c)	=	138.3884	(1c) - (3c)
Second floor	23.4000 (1d)	x	2.7700 (2d)	=	64.8180	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	120.2400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	319.9152	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.2500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2125	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2709	0.2656	0.2603	0.2338	0.2284	0.2019	0.2019	0.1966	0.2125	0.2284	0.2391	0.2497	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	80.1000 (23c)

Effective ac	0.3704	0.3651	0.3598	0.3332	0.3279	0.3014	0.3014	0.2961	0.3120	0.3279	0.3386	0.3492	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door			4.1400	1.0000	4.1400			(26)
Window			10.9700	0.7752	8.5039			(27)
GF			47.0600	0.0900	4.2354	75.0000	3529.5000	(28a)
Exposed Floor			2.7200	0.1400	0.3808	20.0000	54.4000	(28b)
Main	136.0800	15.1100	120.9700	0.1300	15.7261	9.0000	1088.7300	(29a)
Dwarf Wall (PIRx0.72)	16.7700		16.7700	0.0900	1.5093	9.0000	150.9300	(29a)
PIJ	15.5100		15.5100	0.1300	2.0163	9.0000	139.5900	(30)
PIR	12.2300		12.2300	0.1300	1.5899	9.0000	110.0700	(30)
Residual Ceiling	26.3800		26.3800	0.0900	2.3742	9.0000	237.4200	(30)
Total net area of external elements Aum(A, m2)			256.7500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		40.4759			(33)
Main dwelling								
Party Wall 1			40.6300	0.0000	0.0000	20.0000	812.6000	(32)

Timber	124.1700		9.0000	1117.5300 (32c)
FF	47.0600		18.0000	847.0800 (32d)
SF	23.4000		18.0000	421.2000 (32d)
GF	47.0600		9.0000	423.5400 (32e)
FF	23.4000		9.0000	210.6000 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 9143.1900 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 76.0412 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	10.6900	0.1150	1.2293
E3 Sill	10.6900	0.0170	0.1817
E4 Jamb	35.4000	0.0940	3.3276
E5 Ground floor (normal)	22.8600	0.0670	1.5316
E11 Eaves (insulation at rafter level)	18.1000	0.0250	0.4525
E16 Corner (normal)	29.0400	0.0680	1.9747
E12 Gable (insulation at ceiling level)	5.6600	0.0770	0.4358
E6 Intermediate floor within a dwelling	39.5500	0.0320	1.2656
E17 Corner (inverted - internal area greater than external area)	2.4800	-0.0290	-0.0719
P1 Party wall - Ground floor	6.2400	0.3200	1.9968
E20 Exposed floor (normal)	3.3800	0.0790	0.2670
E21 Exposed floor (inverted)	3.3800	0.0630	0.2129
E13 Gable (insulation at rafter level)	8.2800	0.0740	0.6127
E18 Party wall between dwellings	5.5600	0.0920	0.5115
R6 Flat ceiling	18.1000	-0.0430	-0.7783
E25 Staggered party wall between dwellings	4.9600	0.0560	0.2778

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 13.4275 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 53.9034 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	39.1078	38.5470	37.9861	35.1819	34.6210	31.8168	31.8168	31.2559	32.9385	34.6210	35.7427	36.8644	(38)
Heat transfer coeff	93.0112	92.4503	91.8895	89.0852	88.5244	85.7201	85.7201	85.1593	86.8418	88.5244	89.6461	90.7678	(39)

Average = Sum(39)m / 12 = 88.9450

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7735	0.7689	0.7642	0.7409	0.7362	0.7129	0.7129	0.7082	0.7222	0.7362	0.7456	0.7549	(40)
HLP (average)												0.7397	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.8642 (42)
Hot water usage for mixer showers

72.2437	71.1580	69.5759	66.5490	64.3151	61.8240	60.4080	61.9781	63.6992	66.3739	69.4659	71.9669	(42a)

Hot water usage for baths

31.1904	30.7271	30.0748	28.8721	27.9715	26.9729	26.4334	27.0812	27.7865	28.8550	30.0826	31.0849	(42b)

Hot water usage for other uses

43.9627	42.3640	40.7654	39.1667	37.5681	35.9694	35.9694	37.5681	39.1667	40.7654	42.3640	43.9627	(42c)

Average daily hot water use (litres/day) 135.4907 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	147.3967	144.2491	140.4161	134.5878	129.8547	124.7663	122.8109	126.6274	130.6524	135.9943	141.9125	147.0144	(44)
Energy conte	233.4403	205.4088	215.8143	184.2439	174.8094	153.4147	148.5292	156.7911	161.1075	184.5430	202.1803	230.1891	(45)
Energy content (annual)										Total = Sum(45)m =		2250.4717	
Distribution loss (46)m = 0.15 x (45)m	35.0160	30.8113	32.3722	27.6366	26.2214	23.0122	22.2794	23.5187	24.1661	27.6815	30.3271	34.5284	(46)
Water storage loss:													
Store volume												210.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5800	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8532	(55)
Total storage loss	26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(56)
If cylinder contains dedicated solar storage	26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	283.1519	250.3096	265.5259	232.3519	224.5210	201.5227	198.2408	206.5027	209.2155	234.2546	250.2883	279.9007	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	283.1519	250.3096	265.5259	232.3519	224.5210	201.5227	198.2408	206.5027	209.2155	234.2546	250.2883	279.9007	(64)
										Total per year (kWh/year) = Sum(64)m =		2835.7857	(64)
12Total per year (kWh/year)												2836	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	117.3882	104.2191	111.5276	99.7475	97.8934	89.4968	89.1552	91.9023	92.0546	101.1298	105.7114	116.3071	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	173.9086	192.5416	173.9086	179.7055	173.9086	179.7055	173.9086	173.9086	179.7055	173.9086	179.7055	173.9086	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	285.5253	288.4881	281.0218	265.1269	245.0625	226.2048	213.6066	210.6438	218.1101	234.0050	254.0694	272.9272	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	(71)
Water heating gains (Table 5)	157.7798	155.0879	149.9026	138.5382	131.5771	124.3011	119.8323	123.5246	127.8537	135.9272	146.8213	156.3268	(72)
Total internal gains	683.1772	702.0812	670.7966	649.3342	616.5118	596.1749	573.3110	574.0405	591.6328	609.8043	646.5598	669.1261	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	5.8000	19.6403	0.3000	0.0000	0.7700	26.3140	(76)
South	2.3600	46.7521	0.3000	0.0000	0.7700	25.4874	(78)
West	2.8100	19.6403	0.3000	0.0000	0.7700	12.7487	(80)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	64.5501	118.1567	179.0161	243.6322	287.5543	290.5234	278.0979	245.4860	201.9064	135.6952	78.9178	54.1467	(83)
Total gains	747.7273	820.2379	849.8127	892.9664	904.0661	886.6983	851.4090	819.5266	793.5392	745.4994	725.4776	723.2728	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	27.3061	27.4718	27.6395	28.5095	28.6901	29.6287	29.6287	29.8238	29.2460	28.6901	28.3311	27.9810	
alpha	2.8204	2.8315	2.8426	2.9006	2.9127	2.9752	2.9752	2.9883	2.9497	2.9127	2.8887	2.8654	
util living area	0.9297	0.9075	0.8773	0.8089	0.7086	0.5523	0.4202	0.4490	0.6346	0.8169	0.9003	0.9343	(86)
Living	18.9939	19.2566	19.6220	20.1555	20.5653	20.8583	20.9533	20.9426	20.7709	20.2583	19.5950	18.9970	
Non living	18.4155	18.6757	19.0363	19.5662	19.9536	20.2289	20.3028	20.2996	20.1510	19.6734	19.0255	18.4301	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	19.9738	19.2566	19.6220	20.1555	20.5653	20.8583	20.9533	20.9426	20.7709	20.2583	19.5950	19.2772	(87)
Th 2	20.2763	20.2804	20.2845	20.3048	20.3089	20.3294	20.3294	20.3336	20.3212	20.3089	20.3008	20.2926	(88)
util rest of house	0.9228	0.8986	0.8651	0.7895	0.6779	0.5068	0.3625	0.3916	0.5913	0.7947	0.8894	0.9279	(89)
MIT 2	19.3244	18.6757	19.0363	19.5662	19.9536	20.2289	20.3028	20.2996	20.1510	19.6734	19.0255	18.6906	(90)
Living area fraction										fLA = Living area / (4) =		0.2917	(91)
MIT	19.5138	18.8451	19.2072	19.7381	20.1321	20.4125	20.4926	20.4872	20.3318	19.8440	19.1917	18.8617	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5138	18.8451	19.2072	19.7381	20.1321	20.4125	20.4926	20.4872	20.3318	19.8440	19.1917	18.8617	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9145	0.8772	0.8435	0.7719	0.6694	0.5126	0.3769	0.4052	0.5920	0.7780	0.8688	0.9121	(94)
Useful gains	683.7978	719.4962	716.8464	689.2955	605.2247	454.5457	320.8652	332.0421	469.7881	580.0068	630.2904	659.7148	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1415.0565	1289.2330	1167.6571	965.5185	746.4449	498.2492	333.6747	348.0640	541.1839	818.3223	1083.9702	1330.8134	(97)
Space heating kWh	544.0565	382.8631	335.4032	198.8806	105.0678	0.0000	0.0000	0.0000	0.0000	177.3067	326.6495	499.2973	(98a)
Space heating requirement - total per year (kWh/year)												2569.5247	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	544.0565	382.8631	335.4032	198.8806	105.0678	0.0000	0.0000	0.0000	0.0000	177.3067	326.6495	499.2973	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2569.5247	
Space heating per m2											(98c) / (4) =	21.3700	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Efficiency of main space heating system 1 (in %)	281.3941 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	544.0565	382.8631	335.4032	198.8806	105.0678	0.0000	0.0000	0.0000	0.0000	177.3067	326.6495	499.2973	(98)
Space heating efficiency (main heating system 1)	281.3941	281.3941	281.3941	281.3941	281.3941	0.0000	0.0000	0.0000	0.0000	281.3941	281.3941	281.3941	(210)
Space heating fuel (main heating system)	193.3433	136.0594	119.1934	70.6769	37.3383	0.0000	0.0000	0.0000	0.0000	63.0101	116.0826	177.4370	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	283.1519	250.3096	265.5259	232.3519	224.5210	201.5227	198.2408	206.5027	209.2155	234.2546	250.2883	279.9007	(64)
Efficiency of water heater												279.7109	(216)
(217)m	279.7109	279.7109	279.7109	279.7109	279.7109	279.7109	279.7109	279.7109	279.7109	279.7109	279.7109	279.7109	(217)
Fuel for water heating, kWh/month	101.2302	89.4887	94.9287	83.0686	80.2689	72.0468	70.8734	73.8272	74.7970	83.7488	89.4811	100.0678	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	45.0156	40.6593	45.0156	43.5635	45.0156	43.5635	45.0156	45.0156	43.5635	45.0156	43.5635	45.0156	(231)
Lighting	36.6415	29.3952	26.4671	19.3909	14.9781	12.2373	13.6635	17.7604	23.0690	30.2678	34.1874	37.6599	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)

Electricity generated by PVs (Appendix M) (negative quantity)

(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year		
Space heating fuel - main system 1	913.1410	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	279.7109	
Water heating fuel used	1013.8274	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.3580)		
mechanical ventilation fans (SFP = 1.3580)	530.0227	(230a)
Total electricity for the above, kWh/year	530.0227	(231)
Electricity for lighting (calculated in Appendix L)	295.7182	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2752.7093	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	913.1410	0.1550	141.5766	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1013.8274	0.1410	142.9361	(264)
Space and water heating			284.5127	(265)
Pumps, fans and electric keep-hot	530.0227	0.1387	73.5207	(267)
Energy for lighting	295.7182	0.1443	42.6813	(268)
Total CO2, kg/year			400.7146	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.3300	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	913.1410	1.5740	1437.2644	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1013.8274	1.5213	1542.3577	(278)
Space and water heating			2979.6221	(279)
Pumps, fans and electric keep-hot	530.0227	1.5128	801.8183	(281)
Energy for lighting	295.7182	1.5338	453.5824	(282)
Total Primary energy kWh/year			4235.0228	(286)
Dwelling Primary energy Rate (DPER)			35.2200	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.0600 (1b)	x	2.4800 (2b)	=	116.7088	(1b) - (3b)
First floor	49.7800 (1c)	x	2.7800 (2c)	=	138.3884	(1c) - (3c)
Second floor	23.4000 (1d)	x	2.7700 (2d)	=	64.8180	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	120.2400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	319.9152	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	4 * 10 =	40.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1250	(8)
Pressure test		Yes	

Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.3750	(18)
Number of sides sheltered	2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3188	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4064	0.3985	0.3905	0.3507	0.3427	0.3028	0.3028	0.2949	0.3188	0.3427	0.3586	0.3746	(22b)
Effective ac	0.5826	0.5794	0.5762	0.5615	0.5587	0.5459	0.5459	0.5435	0.5508	0.5587	0.5643	0.5701	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			4.1400	1.0000	4.1400			(26)
TER Opening Type			10.9700	1.1450	12.5611			(27)
GF			47.0600	0.1300	6.1178			(28a)
Exposed Floor			2.7200	0.1300	0.3536			(28b)
Main	136.0800	15.1100	120.9700	0.1800	21.7746			(29a)
Dwarf Wall (PIRx0.72)	16.7700		16.7700	0.1800	3.0186			(29a)
PIJ	15.5100		15.5100	0.1100	1.7061			(30)
PIR	12.2300		12.2300	0.1100	1.3453			(30)
Residual Ceiling	26.3800		26.3800	0.1100	2.9018			(30)
Total net area of external elements Aum(A, m2)			256.7500					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	53.9189			(33)
Main dwelling								
Party Wall 1			40.6300	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	76.0412	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	10.6900	0.0500	0.5345
E3 Sill	10.6900	0.0500	0.5345
E4 Jamb	35.4000	0.0500	1.7700
E5 Ground floor (normal)	22.8600	0.1600	3.6576
E11 Eaves (insulation at rafter level)	18.1000	0.0400	0.7240
E16 Corner (normal)	29.0400	0.0900	2.6136
E12 Gable (insulation at ceiling level)	5.6600	0.0600	0.3396
E6 Intermediate floor within a dwelling	39.5500	0.0000	0.0000
E17 Corner (inverted - internal area greater than external area)	2.4800	-0.0900	-0.2232
P1 Party wall - Ground floor	6.2400	0.0800	0.4992
E20 Exposed floor (normal)	3.3800	0.3200	1.0816
E21 Exposed floor (inverted)	3.3800	0.3200	1.0816
E13 Gable (insulation at rafter level)	8.2800	0.0800	0.6624
E18 Party wall between dwellings	5.5600	0.0600	0.3336
R6 Flat ceiling	18.1000	0.0600	1.0860
E25 Staggered party wall between dwellings	4.9600	0.0600	0.2976

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	14.9926	(36)
Point Thermal bridges	(36a) = 0.0000	
Total fabric heat loss	(33) + (36) + (36a) = 68.9115	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	61.5060	61.1674	60.8355	59.2766	58.9849	57.6271	57.6271	57.3757	58.1501	58.9849	59.5749	60.1918	(38)
Heat transfer coeff	130.4175	130.0789	129.7470	128.1880	127.8964	126.5386	126.5386	126.2871	127.0616	127.8964	128.4864	129.1033	(39)
Average = Sum(39)m / 12 =												128.1866	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0846	1.0818	1.0791	1.0661	1.0637	1.0524	1.0524	1.0503	1.0567	1.0637	1.0686	1.0737	(40)
HLP (average)												1.0661	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.8642	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
72.2437	71.1580	69.5759	66.5490	64.3151	61.8240	60.4080	61.9781	63.6992	66.3739	69.4659	71.9669	(42a)

Hot water usage for baths

31.1904	30.7271	30.0748	28.8721	27.9715	26.9729	26.4334	27.0812	27.7865	28.8550	30.0826	31.0849	(42b)

Hot water usage for other uses

43.9627	42.3640	40.7654	39.1667	37.5681	35.9694	35.9694	37.5681	39.1667	40.7654	42.3640	43.9627	(42c)

Average daily hot water use (litres/day)	135.4907	(43)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use												
147.3967	144.2491	140.4161	134.5878	129.8547	124.7663	122.8109	126.6274	130.6524	135.9943	141.9125	147.0144	(44)
Energy conte 233.4403	205.4088	215.8143	184.2439	174.8094	153.4147	148.5292	156.7911	161.1075	184.5430	202.1803	230.1891	(45)
Energy content (annual)										Total = Sum(45)m =		2250.4717	
Distribution loss (46)m = 0.15 x (45)m													
35.0160	30.8113	32.3722	27.6366	26.2214	23.0122	22.2794	23.5187	24.1661	27.6815	30.3271	34.5284	(46)

Water storage loss:		
Store volume	210.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):	1.7016	(48)
Temperature factor from Table 2b	0.5400	(49)
Enter (49) or (54) in (55)	0.9188	(55)

Total storage loss

28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842	(56)

If cylinder contains dedicated solar storage

28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

285.1869	252.1477	267.5609	234.3213	226.5560	203.4920	200.2757	208.5377	211.1848	236.2896	252.2577	281.9357	(62)
WWHRS -33.0268	-29.2092	-30.5861	-25.3265	-23.6034	-20.1976	-18.9320	-20.1323	-20.8972	-24.6355	-27.9091	-32.4152	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

	252.1601	222.9385	236.9748	208.9947	202.9525	183.2944	181.3437	188.4054	190.2876	211.6541	224.3486	249.5205 (64)
										Total per year (kWh/year) = Sum(64)m =		2552.8750 (64)
12Total per year (kWh/year)												2553 (64)

Electric shower(s)

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000 (64a)

Heat gains from water heating, kWh/month

	119.0162	105.6895	113.1555	101.3230	99.5214	91.0723	90.7832	93.5303	93.6301	102.7578	107.2868	117.9351 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	169.4681	187.6254	169.4681	175.1171	169.4681	175.1171	169.4681	169.4681	175.1171	169.4681	175.1171	169.4681	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	285.5253	288.4881	281.0218	265.1269	245.0625	226.2048	213.6066	210.6438	218.1101	234.0050	254.0694	272.9272	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	(71)

Water heating gains (Table 5)

	159.9680	157.2761	152.0908	140.7264	133.7653	126.4893	122.0205	125.7128	130.0418	138.1154	149.0095	158.5150	(72)

Total internal gains

	683.9250	702.3532	671.5443	649.9339	617.2595	593.7747	571.0588	571.7883	589.2325	610.5520	647.1595	669.8738	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	5.8000	19.6403	0.6300	0.7000	0.7700	34.8135	(76)
South	2.3600	46.7521	0.6300	0.7000	0.7700	33.7198	(78)
West	2.8100	19.6403	0.6300	0.7000	0.7700	16.8665	(80)

Solar gains	85.3997	156.3213	236.8383	322.3254	380.4344	384.3624	367.9236	324.7780	267.1221	179.5247	104.4083	71.6361	(83)
Total gains	769.3247	858.6745	908.3826	972.2593	997.6939	978.1370	938.9824	896.5663	856.3547	790.0767	751.5678	741.5099	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	19.4742	19.5249	19.5748	19.8129	19.8581	20.0712	20.0712	20.1111	19.9885	19.8581	19.7669	19.6724	
alpha	2.2983	2.3017	2.3050	2.3209	2.3239	2.3381	2.3381	2.3407	2.3326	2.3239	2.3178	2.3115	
util living area	0.9389	0.9200	0.8939	0.8398	0.7579	0.6320	0.5068	0.5400	0.7081	0.8530	0.9174	0.9433	(86)
MIT	18.0371	18.3421	18.8184	19.4933	20.1103	20.6046	20.8331	20.8002	20.4433	19.6526	18.7533	17.9954	(87)
Th 2	20.0134	20.0157	20.0180	20.0286	20.0306	20.0399	20.0399	20.0416	20.0363	20.0306	20.0266	20.0224	(88)
util rest of house	0.9316	0.9105	0.8806	0.8183	0.7218	0.5710	0.4189	0.4543	0.6544	0.8290	0.9061	0.9366	(89)
MIT 2	16.5333	16.9190	17.5208	18.3680	19.1207	19.6961	19.9290	19.9023	19.5240	18.5785	17.4502	16.4851	(90)
Living area fraction									fLA = Living area / (4) =			0.2917	(91)
MIT	16.9720	17.3342	17.8994	18.6963	19.4094	19.9611	20.1927	20.1642	19.7922	18.8919	17.8303	16.9257	(92)
Temperature adjustment												0.0000	
adjusted MIT	16.9720	17.3342	17.8994	18.6963	19.4094	19.9611	20.1927	20.1642	19.7922	18.8919	17.8303	16.9257	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8997	0.8754	0.8433	0.7822	0.6950	0.5655	0.4339	0.4661	0.6389	0.7938	0.8713	0.9060	(94)
Useful gains	692.1970	751.6557	766.0180	760.5352	693.4127	553.0905	407.4087	417.8957	547.1630	627.1991	654.8764	671.8256	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1652.6547	1617.4261	1479.0344	1255.7716	986.0044	678.3892	454.6190	475.3744	723.2625	1060.4995	1378.7029	1642.9358	(97)
Space heating kWh	714.5806	581.7977	530.4842	356.5702	217.6882	0.0000	0.0000	0.0000	0.0000	322.3755	521.1551	722.5060	(98a)
Space heating requirement - total per year (kWh/year)												3967.1574	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	714.5806	581.7977	530.4842	356.5702	217.6882	0.0000	0.0000	0.0000	0.0000	322.3755	521.1551	722.5060	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3967.1574	
Space heating per m2											(98c) / (4) =	32.9937	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	714.5806	581.7977	530.4842	356.5702	217.6882	0.0000	0.0000	0.0000	0.0000	322.3755	521.1551	722.5060	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)

Space heating fuel (main heating system)

	774.1935	630.3334	574.7391	386.3166	235.8486	0.0000	0.0000	0.0000	0.0000	349.2692	564.6317	782.7800 (211)

Space heating efficiency (main heating system 2)

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)

Space heating fuel (main heating system 2)

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)

Space heating fuel (secondary)

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)

Water heating

Water heating requirement

	252.1601	222.9385	236.9748	208.9947	202.9525	183.2944	181.3437	188.4054	190.2876	211.6541	224.3486	249.5205 (64)

Efficiency of water heater

												79.8000 (216)
(217)m	86.2624	86.1096	85.8116	85.2472	84.2173	79.8000	79.8000	79.8000	79.8000	85.0005	85.8851	86.3015 (217)

Fuel for water heating, kWh/month

	292.3176	258.9010	276.1569	245.1632	240.9868	229.6923	227.2477	236.0970	238.4556	249.0032	261.2196	289.1266 (219)

Space cooling fuel requirement

(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	35.2121	28.2485	25.4346	18.6345	14.3938	11.7599	13.1305	17.0676	22.1691	29.0870	32.8537	36.1908 (232)

Electricity generated by PVs (Appendix M) (negative quantity)

(233a)m	-44.8072	-63.5497	-91.8382	-103.7677	-112.2423	-104.8160	-103.4928	-97.5518	-87.0985	-72.9046	-49.3875	-38.6916 (233a)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)

Electricity generated by PVs (Appendix M) (negative quantity)

(233b)m	-24.0979	-50.8552	-101.4085	-152.8048	-202.5583	-203.7721	-201.4037	-170.3034	-124.5108	-72.9191	-32.2313	-19.0454 (233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year

Space heating fuel - main system 1	4298.1120 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	79.8000
Water heating fuel used	3044.3677 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
Total electricity for the above, kWh/year	86.0000 (231)
Electricity for lighting (calculated in Appendix L)	284.1821 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-2326.0585 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	5386.6033 (238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	4298.1120	0.2100	902.6035	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3044.3677	0.2100	639.3172	(264)
Space and water heating			1541.9207	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	284.1821	0.1443	41.0163	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-970.1480	0.1345	-130.4743	
PV Unit electricity exported	-1355.9105	0.1258	-170.5666	
Total			-301.0408	(269)
Total CO2, kg/year			1293.8254	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.7600	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	4298.1120	1.1300	4856.8666	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3044.3677	1.1300	3440.1354	(278)
Space and water heating			8297.0020	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	284.1821	1.5338	435.8880	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-970.1480	1.4970	-1452.3538	
PV Unit electricity exported	-1355.9105	0.4617	-626.0894	
Total			-2078.4431	(283)
Total Primary energy kWh/year			6784.5477	(286)
Target Primary Energy Rate (TPER)			56.4300	(287)

Full SAP Calculation Printout

Property Reference	78449-18	**Issued on Date**	03/10/2025
Assessment Reference	001	**Prop Type Ref**	End
Property	820 Rochdale Road, MANCHESTER, M9 8FA		

SAP Rating	84 B	**DER**	3.33	**TER**	10.76
Environmental	97 A	**% DER < TER**			69.05
CO_2 Emissions (t/year)	0.38	**DFEE**	33.44	**TFEE**	38.50
Compliance Check	See BREL	**% DFEE < TFEE**			13.15
% DPER < TPER	37.58	**DPER**	35.22	**TPER**	56.43

Assessor Details	Mr. Daniel Goddard	**Assessor ID**	CP52-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.0600 (1b)	x	2.4800 (2b)	=	116.7088	(1b) - (3b)
First floor	49.7800 (1c)	x	2.7800 (2c)	=	138.3884	(1c) - (3c)
Second floor	23.4000 (1d)	x	2.7700 (2d)	=	64.8180	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	120.2400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	319.9152	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	4 * 10 =	40.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1250	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3750	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3188	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4064	0.3985	0.3905	0.3507	0.3427	0.3028	0.3028	0.2949	0.3188	0.3427	0.3586	0.3746	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5826	0.5794	0.5762	0.5615	0.5587	0.5459	0.5459	0.5435	0.5508	0.5587	0.5643	0.5701	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door			4.1400	1.0000	4.1400			(26)
Window			10.9700	0.7752	8.5039			(27)
GF			47.0600	0.0900	4.2354	75.0000	3529.5000	(28a)
Exposed Floor			2.7200	0.1400	0.3808	20.0000	54.4000	(28b)
Main	136.0800	15.1100	120.9700	0.1300	15.7261	9.0000	1088.7300	(29a)
Dwarf Wall (PIRx0.72)	16.7700		16.7700	0.0900	1.5093	9.0000	150.9300	(29a)
PIJ	15.5100		15.5100	0.1300	2.0163	9.0000	139.5900	(30)
PIR	12.2300		12.2300	0.1300	1.5899	9.0000	110.0700	(30)
Residual Ceiling	26.3800		26.3800	0.0900	2.3742	9.0000	237.4200	(30)
Total net area of external elements Aum(A, m2)			256.7500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		40.4759			(33)
Main dwelling								
Party Wall 1			40.6300	0.0000	0.0000	20.0000	812.6000	(32)
Timber			124.1700			9.0000	1117.5300	(32c)
FF			47.0600			18.0000	847.0800	(32d)
SF			23.4000			18.0000	421.2000	(32d)

GF	47.0600		9.0000	423.5400 (32e)
FF	23.4000		9.0000	210.6000 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 9143.1900 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 76.0412 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	10.6900	0.1150	1.2293
E3 Sill	10.6900	0.0170	0.1817
E4 Jamb	35.4000	0.0940	3.3276
E5 Ground floor (normal)	22.8600	0.0670	1.5316
E11 Eaves (insulation at rafter level)	18.1000	0.0250	0.4525
E16 Corner (normal)	29.0400	0.0680	1.9747
E12 Gable (insulation at ceiling level)	5.6600	0.0770	0.4358
E6 Intermediate floor within a dwelling	39.5500	0.0320	1.2656
E17 Corner (inverted - internal area greater than external area)	2.4800	-0.0290	-0.0719
P1 Party wall - Ground floor	6.2400	0.3200	1.9968
E20 Exposed floor (normal)	3.3800	0.0790	0.2670
E21 Exposed floor (inverted)	3.3800	0.0630	0.2129
E13 Gable (insulation at rafter level)	8.2800	0.0740	0.6127
E18 Party wall between dwellings	5.5600	0.0920	0.5115
R6 Flat ceiling	18.1000	-0.0430	-0.7783
E25 Staggered party wall between dwellings	4.9600	0.0560	0.2778

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 13.4275 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 53.9034 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	61.5060	61.1674	60.8355	59.2766	58.9849	57.6271	57.6271	57.3757	58.1501	58.9849	59.5749	60.1918	(38)
Heat transfer coeff	115.4094	115.0708	114.7388	113.1799	112.8882	111.5305	111.5305	111.2790	112.0535	112.8882	113.4783	114.0952	(39)
Average = Sum(39)m / 12 =												113.1785	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9598	0.9570	0.9542	0.9413	0.9389	0.9276	0.9276	0.9255	0.9319	0.9389	0.9438	0.9489	(40)
HLP (average)												0.9413	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.8642 (42)
Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

31.1904	30.7271	30.0748	28.8721	27.9715	26.9729	26.4334	27.0812	27.7865	28.8550	30.0826	31.0849	(42b)

Hot water usage for other uses

43.9627	42.3640	40.7654	39.1667	37.5681	35.9694	35.9694	37.5681	39.1667	40.7654	42.3640	43.9627	(42c)

Average daily hot water use (litres/day) 68.8844 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	75.1530	73.0911	70.8402	68.0388	65.5396	62.9423	62.4029	64.6493	66.9532	69.6204	72.4466	75.0476	(44)
Energy conte	119.0240	104.0808	108.8787	93.1417	88.2288	77.3949	75.4709	80.0493	82.5600	94.4742	103.2134	117.5064	(45)

Energy content (annual) Total = Sum(45)m = 1144.0232
Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss:
Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

101.1704	88.4687	92.5469	79.1705	74.9945	65.7857	64.1503	68.0419	70.1760	80.3031	87.7314	99.8804	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

101.1704	88.4687	92.5469	79.1705	74.9945	65.7857	64.1503	68.0419	70.1760	80.3031	87.7314	99.8804	(64)

Total per year (kWh/year) = Sum(64)m = 972.4197 (64)
12Total per year (kWh/year) 972 (64)
Electric shower(s)

57.8551	51.5494	56.2900	53.7168	54.7248	52.2022	53.9422	54.7248	53.7168	56.2900	55.2315	57.8551	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 658.0987 (64a)
Heat gains from water heating, kWh/month

39.7564	35.0045	37.2092	33.2218	32.4298	29.4970	29.5231	30.6917	30.9732	34.1483	35.7407	39.4339	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	173.9086	192.5416	173.9086	179.7055	173.9086	179.7055	173.9086	173.9086	179.7055	173.9086	179.7055	173.9086	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	285.5253	288.4881	281.0218	265.1269	245.0625	226.2048	213.6066	210.6438	218.1101	234.0050	254.0694	272.9272	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	(71)
Water heating gains (Table 5)	53.4360	52.0901	50.0124	46.1414	43.5885	40.9680	39.6816	41.2523	43.0183	45.8982	49.6399	53.0025	(72)
Total internal gains	578.8334	599.0834	570.9064	556.9374	528.5231	512.8418	493.1604	491.7682	506.7975	519.7753	549.3784	565.8018	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	5.8000	19.6403	0.3000	0.0000	0.7700	26.3140	(76)
South	2.3600	46.7521	0.3000	0.0000	0.7700	25.4874	(78)
West	2.8100	19.6403	0.3000	0.0000	0.7700	12.7487	(80)

Solar gains	64.5501	118.1567	179.0161	243.6322	287.5543	290.5234	278.0979	245.4860	201.9064	135.6952	78.9178	54.1467	(83)
Total gains	643.3835	717.2401	749.9225	800.5696	816.0775	803.3652	771.2583	737.2542	708.7039	655.4705	628.2962	619.9485	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	22.0067	22.0714	22.1353	22.4402	22.4981	22.7720	22.7720	22.8235	22.6657	22.4981	22.3812	22.2601	
alpha	2.4671	2.4714	2.4757	2.4960	2.4999	2.5181	2.5181	2.5216	2.5110	2.4999	2.4921	2.4840	
util living area	0.9545	0.9390	0.9185	0.8716	0.7975	0.6723	0.5432	0.5774	0.7456	0.8817	0.9368	0.9582	(86)
MIT	18.1808	18.4655	18.9019	19.5461	20.1354	20.6218	20.8436	20.8121	20.4680	19.7084	18.8622	18.1466	(87)
Th 2	20.1169	20.1193	20.1216	20.1326	20.1346	20.1441	20.1441	20.1459	20.1405	20.1346	20.1305	20.1261	(88)
util rest of house	0.9492	0.9319	0.9084	0.8543	0.7670	0.6173	0.4612	0.4980	0.6986	0.8626	0.9282	0.9533	(89)
MIT 2	17.5092	17.7917	18.2242	18.8613	19.4277	19.8776	20.0580	20.0376	19.7454	19.0276	18.1944	17.4813	(90)
Living area fraction										fLA = Living area / (4) =		0.2917	(91)
MIT	17.7051	17.9882	18.4219	19.0611	19.6342	20.0947	20.2872	20.2636	19.9562	19.2262	18.3892	17.6754	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.7051	17.9882	18.4219	19.0611	19.6342	20.0947	20.2872	20.2636	19.9562	19.2262	18.3892	17.6754	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9296	0.9094	0.8836	0.8287	0.7467	0.6139	0.4758	0.5098	0.6872	0.8379	0.9059	0.9347	(94)
Useful gains	598.0778	652.2353	662.6092	663.4077	609.3509	493.1472	366.9930	375.8318	486.9971	549.2384	569.1474	579.4830	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1547.0742	1506.0737	1367.9045	1150.0319	895.6745	612.8278	411.2341	429.9329	656.2072	973.7964	1281.0847	1537.4757	(97)
Space heating kWh	706.0533	573.7794	524.7398	350.3694	213.0248	0.0000	0.0000	0.0000	0.0000	315.8712	512.5949	712.7466	(98a)
Space heating requirement - total per year (kWh/year)												3909.1793	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	706.0533	573.7794	524.7398	350.3694	213.0248	0.0000	0.0000	0.0000	0.0000	315.8712	512.5949	712.7466	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3909.1793	
Space heating per m2											(98c) / (4) =	32.5115	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	1048.3863	825.3254	845.7205	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.6355	0.7101	0.6847	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	666.2432	586.0248	579.1039	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	845.7105	812.3232	776.2837	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	129.2165	168.3660	146.7018	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	32.3041	42.0915	36.6754	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												111.0711	(107)
Energy for space heating												32.5115	(99)
Energy for space cooling												0.9237	(108)
Total												33.4352	(109)
Fabric Energy Efficiency (DFEE)												33.4	(109)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.0600 (1b)	x	2.4800 (2b)	=	116.7088	(1b) - (3b)
First floor	49.7800 (1c)	x	2.7800 (2c)	=	138.3884	(1c) - (3c)
Second floor	23.4000 (1d)	x	2.7700 (2d)	=	64.8180	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	120.2400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	319.9152	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	4 * 10 =	40.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1250	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3750	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3188	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4064	0.3985	0.3905	0.3507	0.3427	0.3028	0.3028	0.2949	0.3188	0.3427	0.3586	0.3746	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0.0000	(23c)
Effective ac	0.5701	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			4.1400	1.0000	4.1400			(26)
TER Opening Type			10.9700	1.1450	12.5611			(27)
GF			47.0600	0.1300	6.1178			(28a)
Exposed Floor			2.7200	0.1300	0.3536			(28b)
Main	136.0800	15.1100	120.9700	0.1800	21.7746			(29a)
Dwarf Wall (PIRx0.72)	16.7700		16.7700	0.1800	3.0186			(29a)
PIJ	15.5100		15.5100	0.1100	1.7061			(30)
PIR	12.2300		12.2300	0.1100	1.3453			(30)
Residual Ceiling	26.3800		26.3800	0.1100	2.9018			(30)
Total net area of external elements Aum(A, m2)			256.7500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		53.9189			(33)
Main dwelling								
Party Wall 1			40.6300	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	76.0412	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	10.6900	0.0500	0.5345
E3 Sill	10.6900	0.0500	0.5345
E4 Jamb	35.4000	0.0500	1.7700
E5 Ground floor (normal)	22.8600	0.1600	3.6576
E11 Eaves (insulation at rafter level)	18.1000	0.0400	0.7240
E16 Corner (normal)	29.0400	0.0900	2.6136
E12 Gable (insulation at ceiling level)	5.6600	0.0600	0.3396
E6 Intermediate floor within a dwelling	39.5500	0.0000	0.0000
E17 Corner (inverted - internal area greater than external area)	2.4800	-0.0900	-0.2232
P1 Party wall - Ground floor	6.2400	0.0800	0.4992
E20 Exposed floor (normal)	3.3800	0.3200	1.0816
E21 Exposed floor (inverted)	3.3800	0.3200	1.0816
E13 Gable (insulation at rafter level)	8.2800	0.0800	0.6624
E18 Party wall between dwellings	5.5600	0.0600	0.3336
R6 Flat ceiling	18.1000	0.0600	1.0860
E25 Staggered party wall between dwellings	4.9600	0.0600	0.2976

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		14.9926	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	68.9115	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	61.5060	61.1674	60.8355	59.2766	58.9849	57.6271	57.6271	57.3757	58.1501	58.9849	59.5749	60.1918	(38)
Heat transfer coeff	130.4175	130.0789	129.7470	128.1880	127.8964	126.5386	126.5386	126.2871	127.0616	127.8964	128.4864	129.1033	(39)
Average = Sum(39)m / 12 =												128.1866	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0846	1.0818	1.0791	1.0661	1.0637	1.0524	1.0524	1.0503	1.0567	1.0637	1.0686	1.0737	(40)
HLP (average)												1.0661	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.8642	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

31.1904	30.7271	30.0748	28.8721	27.9715	26.9729	26.4334	27.0812	27.7865	28.8550	30.0826	31.0849	(42b)

Hot water usage for other uses

43.9627	42.3640	40.7654	39.1667	37.5681	35.9694	35.9694	37.5681	39.1667	40.7654	42.3640	43.9627	(42c)

Average daily hot water use (litres/day)	68.8844 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	75.1530	73.0911	70.8402	68.0388	65.5396	62.9423	62.4029	64.6493	66.9532	69.6204	72.4466	75.0476	(44)
Energy conte	119.0240	104.0808	108.8787	93.1417	88.2288	77.3949	75.4709	80.0493	82.5600	94.4742	103.2134	117.5064	(45)

Energy content (annual) Total = Sum(45)m = 1144.0232
Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss:
Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

101.1704	88.4687	92.5469	79.1705	74.9945	65.7857	64.1503	68.0419	70.1760	80.3031	87.7314	99.8804	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

101.1704	88.4687	92.5469	79.1705	74.9945	65.7857	64.1503	68.0419	70.1760	80.3031	87.7314	99.8804	(64)

Total per year (kWh/year) = Sum(64)m = 972.4197 (64)
12Total per year (kWh/year) 972 (64)
Electric shower(s)

57.8551	51.5494	56.2900	53.7168	54.7248	52.2022	53.9422	54.7248	53.7168	56.2900	55.2315	57.8551	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 658.0987 (64a)
Heat gains from water heating, kWh/month

39.7564	35.0045	37.2092	33.2218	32.4298	29.4970	29.5231	30.6917	30.9732	34.1483	35.7407	39.4339	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

169.4681	187.6254	169.4681	175.1171	169.4681	175.1171	169.4681	169.4681	175.1171	169.4681	175.1171	169.4681	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

285.5253	288.4881	281.0218	265.1269	245.0625	226.2048	213.6066	210.6438	218.1101	234.0050	254.0694	272.9272	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	(71)

Water heating gains (Table 5)

53.4360	52.0901	50.0124	46.1414	43.5885	40.9680	39.6816	41.2523	43.0183	45.8982	49.6399	53.0025	(72)

Total internal gains

574.3930	594.1672	566.4659	552.3490	524.0827	508.2534	488.7199	487.3277	502.2091	515.3349	544.7899	561.3614	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	5.8000	19.6403	0.6300	0.7000	0.7700	34.8135	(76)
South	2.3600	46.7521	0.6300	0.7000	0.7700	33.7198	(78)
West	2.8100	19.6403	0.6300	0.7000	0.7700	16.8665	(80)

Solar gains	85.3997	156.3213	236.8383	322.3254	380.4344	384.3624	367.9236	324.7780	267.1221	179.5247	104.4083	71.6361	(83)
Total gains	659.7927	750.4885	803.3042	874.6744	904.5171	892.6158	856.6435	812.1057	769.3312	694.8596	649.1982	632.9975	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	19.4742	19.5249	19.5748	19.8129	19.8581	20.0712	20.0712	20.1111	19.9885	19.8581	19.7669	19.6724	
alpha	2.2983	2.3017	2.3050	2.3209	2.3239	2.3381	2.3381	2.3407	2.3326	2.3239	2.3178	2.3115	
util living area	0.9543	0.9374	0.9143	0.8644	0.7879	0.6657	0.5410	0.5773	0.7442	0.8806	0.9368	0.9582	(86)
MIT	17.8485	18.1660	18.6602	19.3692	20.0210	20.5551	20.8075	20.7685	20.3736	19.5252	18.5866	17.8054	(87)
Th 2	20.0134	20.0157	20.0180	20.0286	20.0306	20.0399	20.0399	20.0416	20.0363	20.0306	20.0266	20.0224	(88)
util rest of house	0.9487	0.9297	0.9031	0.8452	0.7540	0.6054	0.4508	0.4900	0.6930	0.8599	0.9278	0.9530	(89)
MIT 2	17.1162	17.4308	17.9197	18.6188	19.2434	19.7347	19.9386	19.9137	19.5809	18.7809	17.8574	17.0791	(90)
Living area fraction										fLA = Living area / (4) =		0.2917	(91)
MIT	17.3299	17.6453	18.1358	18.8378	19.4702	19.9740	20.1921	20.1631	19.8122	18.9981	18.0702	17.2910	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.3299	17.6453	18.1358	18.8378	19.4702	19.9740	20.1921	20.1631	19.8122	18.9981	18.0702	17.2910	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9272	0.9047	0.8752	0.8164	0.7313	0.6009	0.4662	0.5020	0.6793	0.8322	0.9032	0.9328	(94)
Useful gains	611.7881	678.9951	703.0556	714.0500	661.4817	536.3310	399.4080	407.7177	522.6036	578.2778	586.3317	590.4503	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1699.3253	1657.8908	1509.7040	1273.9019	993.7831	680.0242	454.5408	475.2287	725.7985	1074.0846	1409.5189	1690.0912	(97)
Space heating kWh	809.1277	657.8179	600.1464	403.0933	247.2322	0.0000	0.0000	0.0000	0.0000	368.8803	592.6948	818.1329	(98a)

Space heating requirement - total per year (kWh/year) 4497.1255
Solar heating kWh

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)

Solar heating contribution - total per year (kWh/year) 0.0000
Space heating kWh

809.1277	657.8179	600.1464	403.0933	247.2322	0.0000	0.0000	0.0000	0.0000	368.8803	592.6948	818.1329	(98c)

Space heating requirement after solar contribution - total per year (kWh/year) 4497.1255
Space heating per m2 (98c) / (4) = 37.4012 (99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	1189.4625	936.3854	959.7822	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.6205	0.6930	0.6649	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	738.1124	648.9392	638.1660	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	955.0040	916.8944	868.4170	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	156.1619	199.3587	171.3067	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	39.0405	49.8397	42.8267	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												131.7068	(107)
Energy for space heating												37.4012	(99)
Energy for space cooling												1.0954	(108)
Total												38.4966	(109)
Fabric Energy Efficiency (TFEE)												38.5	(109)

Full SAP Calculation Printout

Property Reference	78449-18	**Issued on Date**	03/10/2025
Assessment Reference	001	**Prop Type Ref**	End
Property	820 Rochdale Road, MANCHESTER, M9 8FA		

SAP Rating	84 B	**DER**	3.33	**TER**	10.76
Environmental	97 A	**% DER < TER**			69.05
CO_2 Emissions (t/year)	0.38	**DFEE**	33.44	**TFEE**	38.50
Compliance Check	See BREL	**% DFEE < TFEE**			13.15
% DPER < TPER	37.58	**DPER**	35.22	**TPER**	56.43

Assessor Details	Mr. Daniel Goddard	**Assessor ID**	CP52-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.0600 (1b)	x	2.4800 (2b)	=	116.7088	(1b) - (3b)
First floor	49.7800 (1c)	x	2.7800 (2c)	=	138.3884	(1c) - (3c)
Second floor	23.4000 (1d)	x	2.7700 (2d)	=	64.8180	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	120.2400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	319.9152	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.2500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2125	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2709	0.2656	0.2603	0.2338	0.2284	0.2019	0.2019	0.1966	0.2125	0.2284	0.2391	0.2497	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	80.1000 (23c)

Effective ac	0.3704	0.3651	0.3598	0.3332	0.3279	0.3014	0.3014	0.2961	0.3120	0.3279	0.3386	0.3492	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door			4.1400	1.0000	4.1400			(26)
Window			10.9700	0.7752	8.5039			(27)
GF			47.0600	0.0900	4.2354	75.0000	3529.5000	(28a)
Exposed Floor			2.7200	0.1400	0.3808	20.0000	54.4000	(28b)
Main	136.0800	15.1100	120.9700	0.1300	15.7261	9.0000	1088.7300	(29a)
Dwarf Wall (PIRx0.72)	16.7700		16.7700	0.0900	1.5093	9.0000	150.9300	(29a)
PIJ	15.5100		15.5100	0.1300	2.0163	9.0000	139.5900	(30)
PIR	12.2300		12.2300	0.1300	1.5899	9.0000	110.0700	(30)
Residual Ceiling	26.3800		26.3800	0.0900	2.3742	9.0000	237.4200	(30)
Total net area of external elements Aum(A, m2)			256.7500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		40.4759			(33)
Main dwelling								
Party Wall 1			40.6300	0.0000	0.0000	20.0000	812.6000	(32)

Timber	124.1700		9.0000	1117.5300 (32c)
FF	47.0600		18.0000	847.0800 (32d)
SF	23.4000		18.0000	421.2000 (32d)
GF	47.0600		9.0000	423.5400 (32e)
FF	23.4000		9.0000	210.6000 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 9143.1900 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 76.0412 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	10.6900	0.1150	1.2293
E3 Sill	10.6900	0.0170	0.1817
E4 Jamb	35.4000	0.0940	3.3276
E5 Ground floor (normal)	22.8600	0.0670	1.5316
E11 Eaves (insulation at rafter level)	18.1000	0.0250	0.4525
E16 Corner (normal)	29.0400	0.0680	1.9747
E12 Gable (insulation at ceiling level)	5.6600	0.0770	0.4358
E6 Intermediate floor within a dwelling	39.5500	0.0320	1.2656
E17 Corner (inverted - internal area greater than external area)	2.4800	-0.0290	-0.0719
P1 Party wall - Ground floor	6.2400	0.3200	1.9968
E20 Exposed floor (normal)	3.3800	0.0790	0.2670
E21 Exposed floor (inverted)	3.3800	0.0630	0.2129
E13 Gable (insulation at rafter level)	8.2800	0.0740	0.6127
E18 Party wall between dwellings	5.5600	0.0920	0.5115
R6 Flat ceiling	18.1000	-0.0430	-0.7783
E25 Staggered party wall between dwellings	4.9600	0.0560	0.2778

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 13.4275 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 53.9034 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	39.1078	38.5470	37.9861	35.1819	34.6210	31.8168	31.8168	31.2559	32.9385	34.6210	35.7427	36.8644	(38)
Heat transfer coeff	93.0112	92.4503	91.8895	89.0852	88.5244	85.7201	85.7201	85.1593	86.8418	88.5244	89.6461	90.7678	(39)

Average = Sum(39)m / 12 = 88.9450

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7735	0.7689	0.7642	0.7409	0.7362	0.7129	0.7129	0.7082	0.7222	0.7362	0.7456	0.7549	(40)
HLP (average)												0.7397	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.8642 (42)
Hot water usage for mixer showers

72.2437	71.1580	69.5759	66.5490	64.3151	61.8240	60.4080	61.9781	63.6992	66.3739	69.4659	71.9669	(42a)

Hot water usage for baths

31.1904	30.7271	30.0748	28.8721	27.9715	26.9729	26.4334	27.0812	27.7865	28.8550	30.0826	31.0849	(42b)

Hot water usage for other uses

43.9627	42.3640	40.7654	39.1667	37.5681	35.9694	35.9694	37.5681	39.1667	40.7654	42.3640	43.9627	(42c)

Average daily hot water use (litres/day) 135.4907 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	147.3967	144.2491	140.4161	134.5878	129.8547	124.7663	122.8109	126.6274	130.6524	135.9943	141.9125	147.0144	(44)
Energy conte	233.4403	205.4088	215.8143	184.2439	174.8094	153.4147	148.5292	156.7911	161.1075	184.5430	202.1803	230.1891	(45)
Energy content (annual)										Total = Sum(45)m =		2250.4717	
Distribution loss (46)m = 0.15 x (45)m	35.0160	30.8113	32.3722	27.6366	26.2214	23.0122	22.2794	23.5187	24.1661	27.6815	30.3271	34.5284	(46)
Water storage loss:													
Store volume												210.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5800	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8532	(55)
Total storage loss	26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(56)
If cylinder contains dedicated solar storage	26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	283.1519	250.3096	265.5259	232.3519	224.5210	201.5227	198.2408	206.5027	209.2155	234.2546	250.2883	279.9007	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	283.1519	250.3096	265.5259	232.3519	224.5210	201.5227	198.2408	206.5027	209.2155	234.2546	250.2883	279.9007	(64)
										Total per year (kWh/year) = Sum(64)m =		2835.7857	(64)
12Total per year (kWh/year)												2836	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	117.3882	104.2191	111.5276	99.7475	97.8934	89.4968	89.1552	91.9023	92.0546	101.1298	105.7114	116.3071	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	173.9086	192.5416	173.9086	179.7055	173.9086	179.7055	173.9086	173.9086	179.7055	173.9086	179.7055	173.9086	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	285.5253	288.4881	281.0218	265.1269	245.0625	226.2048	213.6066	210.6438	218.1101	234.0050	254.0694	272.9272	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	(71)
Water heating gains (Table 5)	157.7798	155.0879	149.9026	138.5382	131.5771	124.3011	119.8323	123.5246	127.8537	135.9272	146.8213	156.3268	(72)
Total internal gains	683.1772	702.0812	670.7966	649.3342	616.5118	596.1749	573.3110	574.0405	591.6328	609.8043	646.5598	669.1261	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	5.8000	19.6403	0.3000	0.0000	0.7700	26.3140	(76)
South	2.3600	46.7521	0.3000	0.0000	0.7700	25.4874	(78)
West	2.8100	19.6403	0.3000	0.0000	0.7700	12.7487	(80)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	64.5501	118.1567	179.0161	243.6322	287.5543	290.5234	278.0979	245.4860	201.9064	135.6952	78.9178	54.1467	(83)
Total gains	747.7273	820.2379	849.8127	892.9664	904.0661	886.6983	851.4090	819.5266	793.5392	745.4994	725.4776	723.2728	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	27.3061	27.4718	27.6395	28.5095	28.6901	29.6287	29.6287	29.8238	29.2460	28.6901	28.3311	27.9810	
alpha	2.8204	2.8315	2.8426	2.9006	2.9127	2.9752	2.9752	2.9883	2.9497	2.9127	2.8887	2.8654	
util living area	0.9297	0.9075	0.8773	0.8089	0.7086	0.5523	0.4202	0.4490	0.6346	0.8169	0.9003	0.9343	(86)
Living	18.9939	19.2566	19.6220	20.1555	20.5653	20.8583	20.9533	20.9426	20.7709	20.2583	19.5950	18.9970	
Non living	18.4155	18.6757	19.0363	19.5662	19.9536	20.2289	20.3028	20.2996	20.1510	19.6734	19.0255	18.4301	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	19.9738	19.2566	19.6220	20.1555	20.5653	20.8583	20.9533	20.9426	20.7709	20.2583	19.5950	19.2772	(87)
Th 2	20.2763	20.2804	20.2845	20.3048	20.3089	20.3294	20.3294	20.3336	20.3212	20.3089	20.3008	20.2926	(88)
util rest of house	0.9228	0.8986	0.8651	0.7895	0.6779	0.5068	0.3625	0.3916	0.5913	0.7947	0.8894	0.9279	(89)
MIT 2	19.3244	18.6757	19.0363	19.5662	19.9536	20.2289	20.3028	20.2996	20.1510	19.6734	19.0255	18.6906	(90)
Living area fraction										fLA = Living area / (4) =		0.2917	(91)
MIT	19.5138	18.8451	19.2072	19.7381	20.1321	20.4125	20.4926	20.4872	20.3318	19.8440	19.1917	18.8617	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5138	18.8451	19.2072	19.7381	20.1321	20.4125	20.4926	20.4872	20.3318	19.8440	19.1917	18.8617	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9145	0.8772	0.8435	0.7719	0.6694	0.5126	0.3769	0.4052	0.5920	0.7780	0.8688	0.9121	(94)
Useful gains	683.7978	719.4962	716.8464	689.2955	605.2247	454.5457	320.8652	332.0421	469.7881	580.0068	630.2904	659.7148	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1415.0565	1289.2330	1167.6571	965.5185	746.4449	498.2492	333.6747	348.0640	541.1839	818.3223	1083.9702	1330.8134	(97)
Space heating kWh	544.0565	382.8631	335.4032	198.8806	105.0678	0.0000	0.0000	0.0000	0.0000	177.3067	326.6495	499.2973	(98a)
Space heating requirement - total per year (kWh/year)												2569.5247	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	544.0565	382.8631	335.4032	198.8806	105.0678	0.0000	0.0000	0.0000	0.0000	177.3067	326.6495	499.2973	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2569.5247	
Space heating per m2											(98c) / (4) =	21.3700	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Efficiency of main space heating system 1 (in %)	281.3941 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	544.0565	382.8631	335.4032	198.8806	105.0678	0.0000	0.0000	0.0000	0.0000	177.3067	326.6495	499.2973	(98)
Space heating efficiency (main heating system 1)	281.3941	281.3941	281.3941	281.3941	281.3941	0.0000	0.0000	0.0000	0.0000	281.3941	281.3941	281.3941	(210)
Space heating fuel (main heating system)	193.3433	136.0594	119.1934	70.6769	37.3383	0.0000	0.0000	0.0000	0.0000	63.0101	116.0826	177.4370	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	283.1519	250.3096	265.5259	232.3519	224.5210	201.5227	198.2408	206.5027	209.2155	234.2546	250.2883	279.9007	(64)
Efficiency of water heater												279.7109	(216)
(217)m	279.7109	279.7109	279.7109	279.7109	279.7109	279.7109	279.7109	279.7109	279.7109	279.7109	279.7109	279.7109	(217)
Fuel for water heating, kWh/month	101.2302	89.4887	94.9287	83.0686	80.2689	72.0468	70.8734	73.8272	74.7970	83.7488	89.4811	100.0678	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	45.0156	40.6593	45.0156	43.5635	45.0156	43.5635	45.0156	45.0156	43.5635	45.0156	43.5635	45.0156	(231)
Lighting	36.6415	29.3952	26.4671	19.3909	14.9781	12.2373	13.6635	17.7604	23.0690	30.2678	34.1874	37.6599	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)

Electricity generated by PVs (Appendix M) (negative quantity)

(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year		
Space heating fuel - main system 1	913.1410	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	279.7109	
Water heating fuel used	1013.8274	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.3580)		
mechanical ventilation fans (SFP = 1.3580)	530.0227	(230a)
Total electricity for the above, kWh/year	530.0227	(231)
Electricity for lighting (calculated in Appendix L)	295.7182	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2752.7093	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	913.1410	0.1550	141.5766	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1013.8274	0.1410	142.9361	(264)
Space and water heating			284.5127	(265)
Pumps, fans and electric keep-hot	530.0227	0.1387	73.5207	(267)
Energy for lighting	295.7182	0.1443	42.6813	(268)
Total CO2, kg/year			400.7146	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.3300	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	913.1410	1.5740	1437.2644	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1013.8274	1.5213	1542.3577	(278)
Space and water heating			2979.6221	(279)
Pumps, fans and electric keep-hot	530.0227	1.5128	801.8183	(281)
Energy for lighting	295.7182	1.5338	453.5824	(282)
Total Primary energy kWh/year			4235.0228	(286)
Dwelling Primary energy Rate (DPER)			35.2200	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.0600 (1b)	x	2.4800 (2b)	=	116.7088	(1b) - (3b)
First floor	49.7800 (1c)	x	2.7800 (2c)	=	138.3884	(1c) - (3c)
Second floor	23.4000 (1d)	x	2.7700 (2d)	=	64.8180	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	120.2400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	319.9152	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	4 * 10 =	40.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1250	(8)
Pressure test		Yes	

Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.3750	(18)
Number of sides sheltered	2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3188	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4064	0.3985	0.3905	0.3507	0.3427	0.3028	0.3028	0.2949	0.3188	0.3427	0.3586	0.3746	(22b)
Effective ac	0.5826	0.5794	0.5762	0.5615	0.5587	0.5459	0.5459	0.5435	0.5508	0.5587	0.5643	0.5701	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			4.1400	1.0000	4.1400			(26)
TER Opening Type			10.9700	1.1450	12.5611			(27)
GF			47.0600	0.1300	6.1178			(28a)
Exposed Floor			2.7200	0.1300	0.3536			(28b)
Main	136.0800	15.1100	120.9700	0.1800	21.7746			(29a)
Dwarf Wall (PIRx0.72)	16.7700		16.7700	0.1800	3.0186			(29a)
PIJ	15.5100		15.5100	0.1100	1.7061			(30)
PIR	12.2300		12.2300	0.1100	1.3453			(30)
Residual Ceiling	26.3800		26.3800	0.1100	2.9018			(30)
Total net area of external elements Aum(A, m2)			256.7500					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	53.9189			(33)
Main dwelling								
Party Wall 1			40.6300	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	76.0412	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	10.6900	0.0500	0.5345
E3 Sill	10.6900	0.0500	0.5345
E4 Jamb	35.4000	0.0500	1.7700
E5 Ground floor (normal)	22.8600	0.1600	3.6576
E11 Eaves (insulation at rafter level)	18.1000	0.0400	0.7240
E16 Corner (normal)	29.0400	0.0900	2.6136
E12 Gable (insulation at ceiling level)	5.6600	0.0600	0.3396
E6 Intermediate floor within a dwelling	39.5500	0.0000	0.0000
E17 Corner (inverted - internal area greater than external area)	2.4800	-0.0900	-0.2232
P1 Party wall - Ground floor	6.2400	0.0800	0.4992
E20 Exposed floor (normal)	3.3800	0.3200	1.0816
E21 Exposed floor (inverted)	3.3800	0.3200	1.0816
E13 Gable (insulation at rafter level)	8.2800	0.0800	0.6624
E18 Party wall between dwellings	5.5600	0.0600	0.3336
R6 Flat ceiling	18.1000	0.0600	1.0860
E25 Staggered party wall between dwellings	4.9600	0.0600	0.2976

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	14.9926	(36)
Point Thermal bridges	(36a) = 0.0000	
Total fabric heat loss	(33) + (36) + (36a) = 68.9115	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	61.5060	61.1674	60.8355	59.2766	58.9849	57.6271	57.6271	57.3757	58.1501	58.9849	59.5749	60.1918	(38)
Heat transfer coeff	130.4175	130.0789	129.7470	128.1880	127.8964	126.5386	126.5386	126.2871	127.0616	127.8964	128.4864	129.1033	(39)
Average = Sum(39)m / 12 =												128.1866	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0846	1.0818	1.0791	1.0661	1.0637	1.0524	1.0524	1.0503	1.0567	1.0637	1.0686	1.0737	(40)
HLP (average)												1.0661	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.8642	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
72.2437	71.1580	69.5759	66.5490	64.3151	61.8240	60.4080	61.9781	63.6992	66.3739	69.4659	71.9669	(42a)

Hot water usage for baths

31.1904	30.7271	30.0748	28.8721	27.9715	26.9729	26.4334	27.0812	27.7865	28.8550	30.0826	31.0849	(42b)

Hot water usage for other uses

43.9627	42.3640	40.7654	39.1667	37.5681	35.9694	35.9694	37.5681	39.1667	40.7654	42.3640	43.9627	(42c)

Average daily hot water use (litres/day)	135.4907	(43)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use												
147.3967	144.2491	140.4161	134.5878	129.8547	124.7663	122.8109	126.6274	130.6524	135.9943	141.9125	147.0144	(44)
Energy conte 233.4403	205.4088	215.8143	184.2439	174.8094	153.4147	148.5292	156.7911	161.1075	184.5430	202.1803	230.1891	(45)
Energy content (annual)										Total = Sum(45)m =		2250.4717	
Distribution loss (46)m = 0.15 x (45)m													
35.0160	30.8113	32.3722	27.6366	26.2214	23.0122	22.2794	23.5187	24.1661	27.6815	30.3271	34.5284	(46)

Water storage loss:		
Store volume	210.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):	1.7016	(48)
Temperature factor from Table 2b	0.5400	(49)
Enter (49) or (54) in (55)	0.9188	(55)

Total storage loss

28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842	(56)

If cylinder contains dedicated solar storage

28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

285.1869	252.1477	267.5609	234.3213	226.5560	203.4920	200.2757	208.5377	211.1848	236.2896	252.2577	281.9357	(62)
WWHRS -33.0268	-29.2092	-30.5861	-25.3265	-23.6034	-20.1976	-18.9320	-20.1323	-20.8972	-24.6355	-27.9091	-32.4152	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

	252.1601	222.9385	236.9748	208.9947	202.9525	183.2944	181.3437	188.4054	190.2876	211.6541	224.3486	249.5205 (64)
										Total per year (kWh/year) = Sum(64)m =		2552.8750 (64)
12Total per year (kWh/year)												2553 (64)

Electric shower(s)

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000 (64a)

Heat gains from water heating, kWh/month

	119.0162	105.6895	113.1555	101.3230	99.5214	91.0723	90.7832	93.5303	93.6301	102.7578	107.2868	117.9351 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	143.2118	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	169.4681	187.6254	169.4681	175.1171	169.4681	175.1171	169.4681	169.4681	175.1171	169.4681	175.1171	169.4681	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	285.5253	288.4881	281.0218	265.1269	245.0625	226.2048	213.6066	210.6438	218.1101	234.0050	254.0694	272.9272	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	37.3212	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	(71)

Water heating gains (Table 5)

	159.9680	157.2761	152.0908	140.7264	133.7653	126.4893	122.0205	125.7128	130.0418	138.1154	149.0095	158.5150	(72)

Total internal gains

	683.9250	702.3532	671.5443	649.9339	617.2595	593.7747	571.0588	571.7883	589.2325	610.5520	647.1595	669.8738	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	5.8000	19.6403	0.6300	0.7000	0.7700	34.8135	(76)
South	2.3600	46.7521	0.6300	0.7000	0.7700	33.7198	(78)
West	2.8100	19.6403	0.6300	0.7000	0.7700	16.8665	(80)

Solar gains	85.3997	156.3213	236.8383	322.3254	380.4344	384.3624	367.9236	324.7780	267.1221	179.5247	104.4083	71.6361	(83)
Total gains	769.3247	858.6745	908.3826	972.2593	997.6939	978.1370	938.9824	896.5663	856.3547	790.0767	751.5678	741.5099	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	19.4742	19.5249	19.5748	19.8129	19.8581	20.0712	20.0712	20.1111	19.9885	19.8581	19.7669	19.6724	
alpha	2.2983	2.3017	2.3050	2.3209	2.3239	2.3381	2.3381	2.3407	2.3326	2.3239	2.3178	2.3115	
util living area	0.9389	0.9200	0.8939	0.8398	0.7579	0.6320	0.5068	0.5400	0.7081	0.8530	0.9174	0.9433	(86)
MIT	18.0371	18.3421	18.8184	19.4933	20.1103	20.6046	20.8331	20.8002	20.4433	19.6526	18.7533	17.9954	(87)
Th 2	20.0134	20.0157	20.0180	20.0286	20.0306	20.0399	20.0399	20.0416	20.0363	20.0306	20.0266	20.0224	(88)
util rest of house	0.9316	0.9105	0.8806	0.8183	0.7218	0.5710	0.4189	0.4543	0.6544	0.8290	0.9061	0.9366	(89)
MIT 2	16.5333	16.9190	17.5208	18.3680	19.1207	19.6961	19.9290	19.9023	19.5240	18.5785	17.4502	16.4851	(90)
Living area fraction									fLA = Living area / (4) =			0.2917	(91)
MIT	16.9720	17.3342	17.8994	18.6963	19.4094	19.9611	20.1927	20.1642	19.7922	18.8919	17.8303	16.9257	(92)
Temperature adjustment												0.0000	
adjusted MIT	16.9720	17.3342	17.8994	18.6963	19.4094	19.9611	20.1927	20.1642	19.7922	18.8919	17.8303	16.9257	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8997	0.8754	0.8433	0.7822	0.6950	0.5655	0.4339	0.4661	0.6389	0.7938	0.8713	0.9060	(94)
Useful gains	692.1970	751.6557	766.0180	760.5352	693.4127	553.0905	407.4087	417.8957	547.1630	627.1991	654.8764	671.8256	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1652.6547	1617.4261	1479.0344	1255.7716	986.0044	678.3892	454.6190	475.3744	723.2625	1060.4995	1378.7029	1642.9358	(97)
Space heating kWh	714.5806	581.7977	530.4842	356.5702	217.6882	0.0000	0.0000	0.0000	0.0000	322.3755	521.1551	722.5060	(98a)
Space heating requirement - total per year (kWh/year)												3967.1574	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	714.5806	581.7977	530.4842	356.5702	217.6882	0.0000	0.0000	0.0000	0.0000	322.3755	521.1551	722.5060	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3967.1574	
Space heating per m2											(98c) / (4) =	32.9937	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	714.5806	581.7977	530.4842	356.5702	217.6882	0.0000	0.0000	0.0000	0.0000	322.3755	521.1551	722.5060	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)

Space heating fuel (main heating system)

	774.1935	630.3334	574.7391	386.3166	235.8486	0.0000	0.0000	0.0000	0.0000	349.2692	564.6317	782.7800 (211)

Space heating efficiency (main heating system 2)

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)

Space heating fuel (main heating system 2)

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)

Space heating fuel (secondary)

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)

Water heating

Water heating requirement

	252.1601	222.9385	236.9748	208.9947	202.9525	183.2944	181.3437	188.4054	190.2876	211.6541	224.3486	249.5205 (64)

Efficiency of water heater

												79.8000 (216)
(217)m	86.2624	86.1096	85.8116	85.2472	84.2173	79.8000	79.8000	79.8000	79.8000	85.0005	85.8851	86.3015 (217)

Fuel for water heating, kWh/month

	292.3176	258.9010	276.1569	245.1632	240.9868	229.6923	227.2477	236.0970	238.4556	249.0032	261.2196	289.1266 (219)

Space cooling fuel requirement

(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	35.2121	28.2485	25.4346	18.6345	14.3938	11.7599	13.1305	17.0676	22.1691	29.0870	32.8537	36.1908 (232)

Electricity generated by PVs (Appendix M) (negative quantity)

(233a)m	-44.8072	-63.5497	-91.8382	-103.7677	-112.2423	-104.8160	-103.4928	-97.5518	-87.0985	-72.9046	-49.3875	-38.6916 (233a)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)

Electricity generated by PVs (Appendix M) (negative quantity)

(233b)m	-24.0979	-50.8552	-101.4085	-152.8048	-202.5583	-203.7721	-201.4037	-170.3034	-124.5108	-72.9191	-32.2313	-19.0454 (233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year

Space heating fuel - main system 1	4298.1120 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	79.8000
Water heating fuel used	3044.3677 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
Total electricity for the above, kWh/year	86.0000 (231)
Electricity for lighting (calculated in Appendix L)	284.1821 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-2326.0585 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	5386.6033 (238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	4298.1120	0.2100	902.6035	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3044.3677	0.2100	639.3172	(264)
Space and water heating			1541.9207	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	284.1821	0.1443	41.0163	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-970.1480	0.1345	-130.4743	
PV Unit electricity exported	-1355.9105	0.1258	-170.5666	
Total			-301.0408	(269)
Total CO2, kg/year			1293.8254	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.7600	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	4298.1120	1.1300	4856.8666	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3044.3677	1.1300	3440.1354	(278)
Space and water heating			8297.0020	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	284.1821	1.5338	435.8880	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-970.1480	1.4970	-1452.3538	
PV Unit electricity exported	-1355.9105	0.4617	-626.0894	
Total			-2078.4431	(283)
Total Primary energy kWh/year			6784.5477	(286)
Target Primary Energy Rate (TPER)			56.4300	(287)

Full SAP Calculation Printout

Property Reference	78449-18	**Issued on Date**	03/10/2025
Assessment Reference	001	**Prop Type Ref**	End
Property	820 Rochdale Road, MANCHESTER, M9 8FA		

SAP Rating	84 B	**DER**	3.33	**TER**	10.76
Environmental	97 A	**% DER < TER**			69.05
CO_2 Emissions (t/year)	0.38	**DFEE**	33.44	**TFEE**	38.50
Compliance Check	See BREL	**% DFEE < TFEE**			13.15
% DPER < TPER	37.58	**DPER**	35.22	**TPER**	56.43

Assessor Details	Mr. Daniel Goddard	**Assessor ID**	CP52-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.0600 (1b)	x	2.4800 (2b)	=	116.7088	(1b) - (3b)
First floor	49.7800 (1c)	x	2.7800 (2c)	=	138.3884	(1c) - (3c)
Second floor	23.4000 (1d)	x	2.7700 (2d)	=	64.8180	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	120.2400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	319.9152	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.2500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2125	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2709	0.2656	0.2603	0.2338	0.2284	0.2019	0.2019	0.1966	0.2125	0.2284	0.2391	0.2497	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	80.1000 (23c)

Effective ac	0.3704	0.3651	0.3598	0.3332	0.3279	0.3014	0.3014	0.2961	0.3120	0.3279	0.3386	0.3492	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door			4.1400	1.0000	4.1400			(26)
Window			10.9700	0.7752	8.5039			(27)
GF			47.0600	0.0900	4.2354	75.0000	3529.5000	(28a)
Exposed Floor			2.7200	0.1400	0.3808	20.0000	54.4000	(28b)
Main	136.0800	15.1100	120.9700	0.1300	15.7261	9.0000	1088.7300	(29a)
Dwarf Wall (PIRx0.72)	16.7700		16.7700	0.0900	1.5093	9.0000	150.9300	(29a)
PIJ	15.5100		15.5100	0.1300	2.0163	9.0000	139.5900	(30)
PIR	12.2300		12.2300	0.1300	1.5899	9.0000	110.0700	(30)
Residual Ceiling	26.3800		26.3800	0.0900	2.3742	9.0000	237.4200	(30)
Total net area of external elements Aum(A, m2)			256.7500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		40.4759			(33)
Main dwelling								
Party Wall 1			40.6300	0.0000	0.0000	20.0000	812.6000	(32)

Timber	124.1700		9.0000	1117.5300 (32c)
FF	47.0600		18.0000	847.0800 (32d)
SF	23.4000		18.0000	421.2000 (32d)
GF	47.0600		9.0000	423.5400 (32e)
FF	23.4000		9.0000	210.6000 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 9143.1900 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 76.0412 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	10.6900	0.1150	1.2293
E3 Sill	10.6900	0.0170	0.1817
E4 Jamb	35.4000	0.0940	3.3276
E5 Ground floor (normal)	22.8600	0.0670	1.5316
E11 Eaves (insulation at rafter level)	18.1000	0.0250	0.4525
E16 Corner (normal)	29.0400	0.0680	1.9747
E12 Gable (insulation at ceiling level)	5.6600	0.0770	0.4358
E6 Intermediate floor within a dwelling	39.5500	0.0320	1.2656
E17 Corner (inverted - internal area greater than external area)	2.4800	-0.0290	-0.0719
P1 Party wall - Ground floor	6.2400	0.3200	1.9968
E20 Exposed floor (normal)	3.3800	0.0790	0.2670
E21 Exposed floor (inverted)	3.3800	0.0630	0.2129
E13 Gable (insulation at rafter level)	8.2800	0.0740	0.6127
E18 Party wall between dwellings	5.5600	0.0920	0.5115
R6 Flat ceiling	18.1000	-0.0430	-0.7783
E25 Staggered party wall between dwellings	4.9600	0.0560	0.2778

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 13.4275 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 53.9034 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	39.1078	38.5470	37.9861	35.1819	34.6210	31.8168	31.8168	31.2559	32.9385	34.6210	35.7427	36.8644	(38)
Heat transfer coeff	93.0112	92.4503	91.8895	89.0852	88.5244	85.7201	85.7201	85.1593	86.8418	88.5244	89.6461	90.7678	(39)

Average = Sum(39)m / 12 = 88.9450

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7735	0.7689	0.7642	0.7409	0.7362	0.7129	0.7129	0.7082	0.7222	0.7362	0.7456	0.7549	(40)
HLP (average)												0.7397	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.8642 (42)
Hot water usage for mixer showers

72.2437	71.1580	69.5759	66.5490	64.3151	61.8240	60.4080	61.9781	63.6992	66.3739	69.4659	71.9669	(42a)

Hot water usage for baths

31.1904	30.7271	30.0748	28.8721	27.9715	26.9729	26.4334	27.0812	27.7865	28.8550	30.0826	31.0849	(42b)

Hot water usage for other uses

43.9627	42.3640	40.7654	39.1667	37.5681	35.9694	35.9694	37.5681	39.1667	40.7654	42.3640	43.9627	(42c)

Average daily hot water use (litres/day) 135.4907 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	147.3967	144.2491	140.4161	134.5878	129.8547	124.7663	122.8109	126.6274	130.6524	135.9943	141.9125	147.0144	(44)
Energy conte	233.4403	205.4088	215.8143	184.2439	174.8094	153.4147	148.5292	156.7911	161.1075	184.5430	202.1803	230.1891	(45)
Energy content (annual)										Total = Sum(45)m =		2250.4717	
Distribution loss (46)m = 0.15 x (45)m	35.0160	30.8113	32.3722	27.6366	26.2214	23.0122	22.2794	23.5187	24.1661	27.6815	30.3271	34.5284	(46)
Water storage loss:													
Store volume												210.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5800	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8532	(55)
Total storage loss	26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(56)
If cylinder contains dedicated solar storage	26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	283.1519	250.3096	265.5259	232.3519	224.5210	201.5227	198.2408	206.5027	209.2155	234.2546	250.2883	279.9007	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	283.1519	250.3096	265.5259	232.3519	224.5210	201.5227	198.2408	206.5027	209.2155	234.2546	250.2883	279.9007	(64)
										Total per year (kWh/year) = Sum(64)m =		2835.7857	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	117.3882	104.2191	111.5276	99.7475	97.8934	89.4968	89.1552	91.9023	92.0546	101.1298	105.7114	116.3071	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	41.8620	37.1814	30.2380	22.8921	17.1121	14.4468	15.6102	20.2908	27.2342	34.5801	40.3601	43.0254	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	426.1571	430.5793	419.4356	395.7119	365.7649	337.6190	318.8159	314.3937	325.5374	349.2611	379.2081	407.3540	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	(71)
Water heating gains (Table 5)	157.7798	155.0879	149.9026	138.5382	131.5771	124.3011	119.8323	123.5246	127.8537	135.9272	146.8213	156.3268	(72)
Total internal gains	738.1333	735.1831	711.9106	669.4765	626.7886	588.7013	566.5928	570.5435	592.9597	632.1028	678.7239	719.0406	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	5.8000	19.6403	0.3000	0.0000	0.7700	26.3140	(76)
South	2.3600	46.7521	0.3000	0.0000	0.7700	25.4874	(78)
West	2.8100	19.6403	0.3000	0.0000	0.7700	12.7487	(80)

Solar gains	64.5501	118.1567	179.0161	243.6322	287.5543	290.5234	278.0979	245.4860	201.9064	135.6952	78.9178	54.1467 (83)
Total gains	802.6834	853.3397	890.9267	913.1087	914.3429	879.2246	844.6907	816.0295	794.8661	767.7980	757.6417	773.1873 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	27.3061	27.4718	27.6395	28.5095	28.6901	29.6287	29.6287	29.8238	29.2460	28.6901	28.3311	27.9810	
alpha	2.8204	2.8315	2.8426	2.9006	2.9127	2.9752	2.9752	2.9883	2.9497	2.9127	2.8887	2.8654	
util living area	0.9184	0.8998	0.8659	0.8017	0.7042	0.5559	0.4231	0.4506	0.6339	0.8076	0.8912	0.9241	(86)
Living	19.0920	19.3116	19.6827	20.1786	20.5729	20.8558	20.9524	20.9421	20.7716	20.2846	19.6472	19.0884	
Non living	18.5110	18.7288	19.0942	19.5875	19.9603	20.2270	20.3023	20.2993	20.1515	19.6974	19.0756	18.5192	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.0240	19.3116	19.6827	20.1786	20.5729	20.8558	20.9524	20.9421	20.7716	20.2846	19.6472	19.3558	(87)
Th 2	20.2763	20.2804	20.2845	20.3048	20.3089	20.3294	20.3294	20.3336	20.3212	20.3089	20.3008	20.2926	(88)
util rest of house	0.9105	0.8903	0.8528	0.7819	0.6733	0.5102	0.3651	0.3931	0.5906	0.7848	0.8795	0.9168	(89)
MIT 2	19.3733	18.7288	19.0942	19.5875	19.9603	20.2270	20.3023	20.2993	20.1515	19.6974	19.0756	18.7673	(90)
Living area fraction									fLA = Living area / (4) =			0.2917	(91)
MIT	19.5631	18.8988	19.2659	19.7600	20.1390	20.4105	20.4920	20.4868	20.3324	19.8687	19.2424	18.9390	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5631	18.8988	19.2659	19.7600	20.1390	20.4105	20.4920	20.4868	20.3324	19.8687	19.2424	18.9390	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9019	0.8686	0.8314	0.7647	0.6652	0.5159	0.3795	0.4067	0.5914	0.7686	0.8588	0.9003	(94)
Useful gains	723.9102	741.2207	740.7056	698.2720	608.2016	453.6232	320.5702	331.8482	470.0486	590.1173	650.6452	696.1084	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1419.6392	1294.1973	1173.0560	967.4617	747.0582	498.0754	333.6211	348.0287	541.2350	820.5048	1088.5184	1337.8239	(97)
Space heating kWh	517.6223	371.6003	321.6686	193.8166	103.3093	0.0000	0.0000	0.0000	0.0000	171.4083	315.2687	477.4363	(98a)
Space heating requirement - total per year (kWh/year)												2472.1305	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	517.6223	371.6003	321.6686	193.8166	103.3093	0.0000	0.0000	0.0000	0.0000	171.4083	315.2687	477.4363	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2472.1305	
Space heating per m2											(98c) / (4) =	20.5600	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	281.3941	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	517.6223	371.6003	321.6686	193.8166	103.3093	0.0000	0.0000	0.0000	0.0000	171.4083	315.2687	477.4363	(98)
Space heating efficiency (main heating system 1)	281.3941	281.3941	281.3941	281.3941	281.3941	0.0000	0.0000	0.0000	0.0000	281.3941	281.3941	281.3941	(210)
Space heating fuel (main heating system)	183.9493	132.0569	114.3125	68.8773	36.7134	0.0000	0.0000	0.0000	0.0000	60.9140	112.0381	169.6682	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	283.1519	250.3096	265.5259	232.3519	224.5210	201.5227	198.2408	206.5027	209.2155	234.2546	250.2883	279.9007	(64)
Efficiency of water heater												279.7109	(216)
(217)m	279.7109	279.7109	279.7109	279.7109	279.7109	279.7109	279.7109	279.7109	279.7109	279.7109	279.7109	279.7109	(217)
Fuel for water heating, kWh/month	101.2302	89.4887	94.9287	83.0686	80.2689	72.0468	70.8734	73.8272	74.7970	83.7488	89.4811	100.0678	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	45.0156	40.6593	45.0156	43.5635	45.0156	43.5635	45.0156	45.0156	43.5635	45.0156	43.5635	45.0156	(231)
Lighting	36.6415	29.3952	26.4671	19.3909	14.9781	12.2373	13.6635	17.7604	23.0690	30.2678	34.1874	37.6599	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													

(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	878.5297	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	279.7109	
Water heating fuel used	1013.8274	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.3580)		
mechanical ventilation fans (SFP = 1.3580)	530.0227	(230a)
Total electricity for the above, kWh/year	530.0227	(231)
Electricity for lighting (calculated in Appendix L)	295.7182	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2718.0980	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	878.5297	16.4900	144.8695	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1013.8274	16.4900	167.1801	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	530.0227	16.4900	87.4007	(249)
Energy for lighting	295.7182	16.4900	48.7639	(250)
Additional standing charges			0.0000	(251)
Total energy cost			448.2144	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.9765	(257)
SAP value		84.1709	
SAP rating (Section 12)		84	(258)
SAP band		B	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	878.5297	0.1550	136.1562	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1013.8274	0.1410	142.9361	(264)
Space and water heating			279.0924	(265)
Pumps, fans and electric keep-hot	530.0227	0.1387	73.5207	(267)
Energy for lighting	295.7182	0.1443	42.6813	(268)
Total CO2, kg/year			395.2943	(272)
CO2 emissions per m2			3.2900	(273)
EI value			96.7944	
EI rating			97	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.0600	(1b) x	2.4800	(2b) =	116.7088	(1b) - (3b)
First floor	49.7800	(1c) x	2.7800	(2c) =	138.3884	(1c) - (3c)
Second floor	23.4000	(1d) x	2.7700	(2d) =	64.8180	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	120.2400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		319.9152	(5)

2. Ventilation rate

m3 per hour

Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.2500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2125	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.6000	4.5000	4.5000	4.1000	4.2000	3.7000	3.5000	3.5000	3.7000	4.1000	4.1000	4.2000	(22)
Wind factor	1.1500	1.1250	1.1250	1.0250	1.0500	0.9250	0.8750	0.8750	0.9250	1.0250	1.0250	1.0500	(22a)
Adj infilt rate	0.2444	0.2391	0.2391	0.2178	0.2231	0.1966	0.1859	0.1859	0.1966	0.2178	0.2178	0.2231	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	80.1000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.3439	0.3386	0.3386	0.3173	0.3226	0.2961	0.2854	0.2854	0.2961	0.3173	0.3173	0.3226	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Door			4.1400	1.0000	4.1400			(26)
Window			10.9700	0.7752	8.5039			(27)
GF			47.0600	0.0900	4.2354	75.0000	3529.5000	(28a)
Exposed Floor			2.7200	0.1400	0.3808	20.0000	54.4000	(28b)
Main	136.0800	15.1100	120.9700	0.1300	15.7261	9.0000	1088.7300	(29a)
Dwarf Wall (PIRx0.72)	16.7700		16.7700	0.0900	1.5093	9.0000	150.9300	(29a)
PIJ	15.5100		15.5100	0.1300	2.0163	9.0000	139.5900	(30)
PIR	12.2300		12.2300	0.1300	1.5899	9.0000	110.0700	(30)
Residual Ceiling	26.3800		26.3800	0.0900	2.3742	9.0000	237.4200	(30)
Total net area of external elements Aum(A, m2)			256.7500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		40.4759			(33)
Main dwelling								
Party Wall 1			40.6300	0.0000	0.0000	20.0000	812.6000	(32)
Timber			124.1700			9.0000	1117.5300	(32c)
FF			47.0600			18.0000	847.0800	(32d)
SF			23.4000			18.0000	421.2000	(32d)
GF			47.0600			9.0000	423.5400	(32e)
FF			23.4000			9.0000	210.6000	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	9143.1900 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		76.0412 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	10.6900	0.1150	1.2293
E3 Sill	10.6900	0.0170	0.1817
E4 Jamb	35.4000	0.0940	3.3276
E5 Ground floor (normal)	22.8600	0.0670	1.5316
E11 Eaves (insulation at rafter level)	18.1000	0.0250	0.4525
E16 Corner (normal)	29.0400	0.0680	1.9747
E12 Gable (insulation at ceiling level)	5.6600	0.0770	0.4358
E6 Intermediate floor within a dwelling	39.5500	0.0320	1.2656
E17 Corner (inverted - internal area greater than external area)	2.4800	-0.0290	-0.0719
P1 Party wall - Ground floor	6.2400	0.3200	1.9968
E20 Exposed floor (normal)	3.3800	0.0790	0.2670
E21 Exposed floor (inverted)	3.3800	0.0630	0.2129
E13 Gable (insulation at rafter level)	8.2800	0.0740	0.6127
E18 Party wall between dwellings	5.5600	0.0920	0.5115
R6 Flat ceiling	18.1000	-0.0430	-0.7783
E25 Staggered party wall between dwellings	4.9600	0.0560	0.2778

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		13.4275 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	53.9034 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	36.3036	35.7427	35.7427	33.4993	34.0602	31.2559	30.1342	30.1342	31.2559	33.4993	33.4993	34.0602	(38)
Heat transfer coeff	90.2069	89.6461	89.6461	87.4027	87.9635	85.1593	84.0376	84.0376	85.1593	87.4027	87.4027	87.9635	(39)
Average = Sum(39)m / 12 =												87.1690	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7502	0.7456	0.7456	0.7269	0.7316	0.7082	0.6989	0.6989	0.7082	0.7269	0.7269	0.7316	(40)
HLP (average)												0.7250	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.8642 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
72.2437	71.1580	69.5759	66.5490	64.3151	61.8240	60.4080	61.9781	63.6992	66.3739	69.4659	71.9669	(42a)

Hot water usage for baths

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
31.1904	30.7271	30.0748	28.8721	27.9715	26.9729	26.4334	27.0812	27.7865	28.8550	30.0826	31.0849	(42b)

Hot water usage for other uses

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
43.9627	42.3640	40.7654	39.1667	37.5681	35.9694	35.9694	37.5681	39.1667	40.7654	42.3640	43.9627	(42c)

Average daily hot water use (litres/day)	135.4907 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	147.3967	144.2491	140.4161	134.5878	129.8547	124.7663	122.8109	126.6274	130.6524	135.9943	141.9125	147.0144	(44)
Energy conte	233.4403	205.4088	215.8143	184.2439	174.8094	153.4147	148.5292	156.7911	161.1075	184.5430	202.1803	230.1891	(45)
Energy content (annual)										Total = Sum(45)m =		2250.4717	
Distribution loss (46)m = 0.15 x (45)m													
	35.0160	30.8113	32.3722	27.6366	26.2214	23.0122	22.2794	23.5187	24.1661	27.6815	30.3271	34.5284	(46)
Water storage loss:													
Store volume												210.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5800	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8532	(55)
Total storage loss													
	26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(56)
If cylinder contains dedicated solar storage													
	26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	283.1519	250.3096	265.5259	232.3519	224.5210	201.5227	198.2408	206.5027	209.2155	234.2546	250.2883	279.9007	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	283.1519	250.3096	265.5259	232.3519	224.5210	201.5227	198.2408	206.5027	209.2155	234.2546	250.2883	279.9007	(64)
										Total per year (kWh/year) = Sum(64)m =		2835.7857	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
						Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =						0.0000	(64a)
Heat gains from water heating, kWh/month													
	117.3882	104.2191	111.5276	99.7475	97.8934	89.4968	89.1552	91.9023	92.0546	101.1298	105.7114	116.3071	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	41.8620	37.1814	30.2380	22.8921	17.1121	14.4468	15.6102	20.2908	27.2342	34.5801	40.3601	43.0254	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	426.1571	430.5793	419.4356	395.7119	365.7649	337.6190	318.8159	314.3937	325.5374	349.2611	379.2081	407.3540	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	(71)
Water heating gains (Table 5)													
	157.7798	155.0879	149.9026	138.5382	131.5771	124.3011	119.8323	123.5246	127.8537	135.9272	146.8213	156.3268	(72)
Total internal gains													
	738.1333	735.1831	711.9106	669.4765	626.7886	588.7013	566.5928	570.5435	592.9597	632.1028	678.7239	719.0406	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	5.8000	16.6187	0.3000	0.0000	0.7700	22.2657	(76)
South	2.3600	39.5594	0.3000	0.0000	0.7700	21.5662	(78)
West	2.8100	16.6187	0.3000	0.0000	0.7700	10.7874	(80)

Solar gains	54.6193	105.0282	167.8276	232.2627	268.0845	275.9972	258.9695	225.1592	191.3721	125.4152	69.3520	48.9899	(83)
Total gains	792.7526	840.2112	879.7382	901.7392	894.8731	864.6985	825.5623	795.7027	784.3319	757.5181	748.0759	768.0305	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	28.1550	28.3311	28.3311	29.0583	28.8730	29.8238	30.2219	30.2219	29.8238	29.0583	29.0583	28.8730	
alpha	2.8770	2.8887	2.8887	2.9372	2.9249	2.9883	3.0148	3.0148	2.9883	2.9372	2.9372	2.9249	
util living area													
	0.9143	0.8951	0.8625	0.7909	0.6844	0.5337	0.4250	0.4474	0.6332	0.8032	0.8849	0.9192	(86)
Living	19.2373	19.4471	19.7603	20.2600	20.6353	20.8806	20.9542	20.9462	20.7806	20.3232	19.7615	19.2427	
Non living	18.6686	18.8765	19.1818	19.6748	20.0209	20.2513	20.3155	20.3103	20.1702	19.7406	19.1992	18.6858	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.0983	19.4471	19.7603	20.2600	20.6353	20.8806	20.9542	20.9462	20.7806	20.3232	19.7615	19.4885	(87)
Th 2	20.2967	20.3008	20.3008	20.3171	20.3130	20.3336	20.3418	20.3418	20.3336	20.3171	20.3171	20.3130	(88)
util rest of house													
	0.9060	0.8851	0.8491	0.7700	0.6508	0.4858	0.3678	0.3894	0.5905	0.7798	0.8725	0.9115	(89)
MIT 2	19.4638	18.8765	19.1818	19.6748	20.0209	20.2513	20.3155	20.3103	20.1702	19.7406	19.1992	18.9134	(90)
Living area fraction										fLA = Living area / (4) =		0.2917	(91)
MIT	19.6489	19.0430	19.3505	19.8456	20.2002	20.4349	20.5019	20.4958	20.3483	19.9106	19.3633	19.0812	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6489	19.0430	19.3505	19.8456	20.2002	20.4349	20.5019	20.4958	20.3483	19.9106	19.3633	19.0812	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8976	0.8641	0.8284	0.7541	0.6450	0.4934	0.3820	0.4033	0.5915	0.7643	0.8524	0.8952	(94)
Useful gains	711.5364	725.9850	728.7616	680.0249	577.1717	426.6080	315.3791	320.9309	463.9177	578.9867	637.6776	687.5499	(95)
Ext temp.	4.7000	5.3000	6.7000	9.3000	12.3000	15.0000	16.6000	16.5000	14.1000	10.8000	7.5000	4.6000	(96)

Heat loss rate W

1348.4944	1232.0040	1134.0715	921.7102	694.9275	462.8308	327.9043	335.7991	532.0977	796.2877	1036.8804	1273.8143	(97)

Space heating kWh

473.8968	340.0448	301.5505	174.0134	87.6103	0.0000	0.0000	0.0000	0.0000	161.6720	287.4260	436.1807	(98a)

Space heating requirement - total per year (kWh/year) 2262.3945

Solar heating kWh

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)

Solar heating contribution - total per year (kWh/year) 0.0000

Space heating kWh

473.8968	340.0448	301.5505	174.0134	87.6103	0.0000	0.0000	0.0000	0.0000	161.6720	287.4260	436.1807	(98c)

Space heating requirement after solar contribution - total per year (kWh/year) 2262.3945

Space heating per m2 (98c) / (4) = 18.8157 (99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (201)

Fraction of space heat from main system(s) 1.0000 (202)

Efficiency of main space heating system 1 (in %) 280.5326 (206)

Efficiency of main space heating system 2 (in %) 0.0000 (207)

Efficiency of secondary/supplementary heating system, % 0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	473.8968	340.0448	301.5505	174.0134	87.6103	0.0000	0.0000	0.0000	0.0000	161.6720	287.4260	436.1807	(98)
Space heating efficiency (main heating system 1)													
	280.5326	280.5326	280.5326	280.5326	0.0000	0.0000	0.0000	0.0000	280.5326	280.5326	280.5326		(210)
Space heating fuel (main heating system)													
	168.9275	121.2140	107.4921	62.0297	31.2300	0.0000	0.0000	0.0000	0.0000	57.6304	102.4573	155.4831	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	283.1519	250.3096	265.5259	232.3519	224.5210	201.5227	198.2408	206.5027	209.2155	234.2546	250.2883	279.9007	(64)
Efficiency of water heater												279.7193	(216)
(217)m	279.7193	279.7193	279.7193	279.7193	279.7193	279.7193	279.7193	279.7193	279.7193	279.7193	279.7193	279.7193	(217)
Fuel for water heating, kWh/month													
	101.2272	89.4860	94.9259	83.0661	80.2665	72.0446	70.8713	73.8250	74.7948	83.7463	89.4784	100.0649	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	45.0156	40.6593	45.0156	43.5635	45.0156	43.5635	45.0156	45.0156	43.5635	45.0156	43.5635	45.0156	(231)
Lighting	36.6415	29.3952	26.4671	19.3909	14.9781	12.2373	13.6635	17.7604	23.0690	30.2678	34.1874	37.6599	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year

Space heating fuel - main system 1 806.4640 (211)

Space heating fuel - main system 2 0.0000 (213)

Space heating fuel - secondary 0.0000 (215)

Efficiency of water heater 279.7193

Water heating fuel used 1013.7971 (219)

Space cooling fuel 0.0000 (221)

Electricity for pumps and fans:

(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.3580)

mechanical ventilation fans (SFP = 1.3580) 530.0227 (230a)

Total electricity for the above, kWh/year 530.0227 (231)

Electricity for lighting (calculated in Appendix L) 295.7182 (232)

Energy saving/generation technologies (Appendices M ,N and Q)

PV generation 0.0000 (233)

Wind generation 0.0000 (234)

Hydro-electric generation (Appendix N) 0.0000 (235a)

Electricity generated - Micro CHP (Appendix N) 0.0000 (235)

Appendix Q - special features

Energy saved or generated -0.0000 (236)

Energy used 0.0000 (237)

Total delivered energy for all uses 2646.0019 (238)

10a. Fuel costs - using BEDF prices (583)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	806.4640	28.4300	229.2777	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1013.7971	28.4300	288.2225	(247)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(247a)
Pumps, fans and electric keep-hot	530.0227	28.4300	150.6855	(249)
Energy for lighting	295.7182	28.4300	84.0727	(250)
Additional standing charges			0.0000	(251)
Total energy cost			752.2583	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy	Emission factor	Emissions	

	kWh/year	kg CO2/kWh	kg CO2/year	
Space heating - main system 1	806.4640	0.1550	125.0208	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1013.7971	0.1410	142.9318	(264)
Space and water heating			267.9527	(265)
Pumps, fans and electric keep-hot	530.0227	0.1387	73.5207	(267)
Energy for lighting	295.7182	0.1443	42.6813	(268)
Total CO2, kg/year			384.1546	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	806.4640	1.5739	1269.3071	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1013.7971	1.5213	1542.3116	(278)
Space and water heating			2811.6187	(279)
Pumps, fans and electric keep-hot	530.0227	1.5128	801.8183	(281)
Energy for lighting	295.7182	1.5338	453.5824	(282)
Total Primary energy kWh/year			4067.0194	(286)

SAP 10 EPC IMPROVEMENTS

001

Current energy efficiency rating: B 84
Current environmental impact rating: A 97

N Solar water heating	Recommended	
U Solar photovoltaic panels	Recommended	
V2 Wind turbine	Not applicable	

Recommended measures:	SAP change	Cost change	CO2 change
N Solar water heating	+ 1.2	-£ 54	-23 kg (6.1%)
U Solar photovoltaic panels	+ 6.9	-£ 288	-207 kg (57.4%)

	Typical annual savings		Energy efficiency	Environmental impact
Recommended measures				
Solar water heating	£54	0.19 kg/m²	B 85	A 97
Solar photovoltaic panels	£288	1.72 kg/m²	A 92	A 99
Total Savings	£342	1.92 kg/m²		

Potential energy efficiency rating: A 92
Potential environmental impact rating: A 99

Fuel prices for cost data on this page from database revision number 583 TEST (01 Oct 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, West Pennines (England)):

	Current	Potential	Saving
Electricity	£752	£699	£54
Space heating	£380	£406	-£26
Water heating	£288	£209	£79
Lighting	£84	£84	£0
Generated (PV)	-£0	-£288	£288
Total cost of fuels	£752	£411	£342
Total cost of uses	£752	£411	£341
Delivered energy	22 kWh/m²	7 kWh/m²	15 kWh/m²
Carbon dioxide emissions	0.4 tonnes	0.2 tonnes	0.2 tonnes
CO2 emissions per m²	3 kg/m²	1 kg/m²	2 kg/m²
Primary energy	34 kWh/m²	18 kWh/m²	16 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.0600 (1b)	x	2.4800 (2b)	=	116.7088	(1b) - (3b)
First floor	49.7800 (1c)	x	2.7800 (2c)	=	138.3884	(1c) - (3c)
Second floor	23.4000 (1d)	x	2.7700 (2d)	=	64.8180	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	120.2400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	319.9152	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)

Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.2500 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2125 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2709	0.2656	0.2603	0.2338	0.2284	0.2019	0.2019	0.1966	0.2125	0.2284	0.2391	0.2497	(22b)

Balanced mechanical ventilation with heat recovery		
If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =		80.1000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.3704	0.3651	0.3598	0.3332	0.3279	0.3014	0.3014	0.2961	0.3120	0.3279	0.3386	0.3492	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Door			4.1400	1.0000	4.1400			(26)
Window			10.9700	0.7752	8.5039			(27)
GF			47.0600	0.0900	4.2354	75.0000	3529.5000	(28a)
Exposed Floor			2.7200	0.1400	0.3808	20.0000	54.4000	(28b)
Main	136.0800	15.1100	120.9700	0.1300	15.7261	9.0000	1088.7300	(29a)
Dwarf Wall (PIRx0.72)	16.7700		16.7700	0.0900	1.5093	9.0000	150.9300	(29a)
PIJ	15.5100		15.5100	0.1300	2.0163	9.0000	139.5900	(30)
PIR	12.2300		12.2300	0.1300	1.5899	9.0000	110.0700	(30)
Residual Ceiling	26.3800		26.3800	0.0900	2.3742	9.0000	237.4200	(30)
Total net area of external elements Aum(A, m2)			256.7500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		40.4759			(33)
Main dwelling								
Party Wall 1			40.6300	0.0000	0.0000	20.0000	812.6000	(32)
Timber			124.1700			9.0000	1117.5300	(32c)
FF			47.0600			18.0000	847.0800	(32d)
SF			23.4000			18.0000	421.2000	(32d)
GF			47.0600			9.0000	423.5400	(32e)
FF			23.4000			9.0000	210.6000	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	9143.1900 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		76.0412 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	10.6900	0.1150	1.2293
E3 Sill	10.6900	0.0170	0.1817
E4 Jamb	35.4000	0.0940	3.3276
E5 Ground floor (normal)	22.8600	0.0670	1.5316
E11 Eaves (insulation at rafter level)	18.1000	0.0250	0.4525
E16 Corner (normal)	29.0400	0.0680	1.9747
E12 Gable (insulation at ceiling level)	5.6600	0.0770	0.4358
E6 Intermediate floor within a dwelling	39.5500	0.0320	1.2656
E17 Corner (inverted - internal area greater than external area)	2.4800	-0.0290	-0.0719
P1 Party wall - Ground floor	6.2400	0.3200	1.9968
E20 Exposed floor (normal)	3.3800	0.0790	0.2670
E21 Exposed floor (inverted)	3.3800	0.0630	0.2129
E13 Gable (insulation at rafter level)	8.2800	0.0740	0.6127
E18 Party wall between dwellings	5.5600	0.0920	0.5115
R6 Flat ceiling	18.1000	-0.0430	-0.7783
E25 Staggered party wall between dwellings	4.9600	0.0560	0.2778

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		13.4275 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	53.9034 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	39.1078	38.5470	37.9861	35.1819	34.6210	31.8168	31.8168	31.2559	32.9385	34.6210	35.7427	36.8644	(38)
Heat transfer coeff	93.0112	92.4503	91.8895	89.0852	88.5244	85.7201	85.7201	85.1593	86.8418	88.5244	89.6461	90.7678	(39)
Average = Sum(39)m / 12 =												88.9450	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7735	0.7689	0.7642	0.7409	0.7362	0.7129	0.7129	0.7082	0.7222	0.7362	0.7456	0.7549	(40)
HLP (average)												0.7397	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.8642 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	72.2437	71.1580	69.5759	66.5490	64.3151	61.8240	60.4080	61.9781	63.6992	66.3739	69.4659	71.9669	(42a)
Hot water usage for baths	31.1904	30.7271	30.0748	28.8721	27.9715	26.9729	26.4334	27.0812	27.7865	28.8550	30.0826	31.0849	(42b)
Hot water usage for other uses	43.9627	42.3640	40.7654	39.1667	37.5681	35.9694	35.9694	37.5681	39.1667	40.7654	42.3640	43.9627	(42c)
Average daily hot water use (litres/day)												135.4907	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use												

	147.3967	144.2491	140.4161	134.5878	129.8547	124.7663	122.8109	126.6274	130.6524	135.9943	141.9125	147.0144	(44)
Energy conte	233.4403	205.4088	215.8143	184.2439	174.8094	153.4147	148.5292	156.7911	161.1075	184.5430	202.1803	230.1891	(45)
Energy content (annual)											Total = Sum(45)m =	2250.4717	
Distribution loss (46)m = 0.15 x (45)m													
	35.0160	30.8113	32.3722	27.6366	26.2214	23.0122	22.2794	23.5187	24.1661	27.6815	30.3271	34.5284	(46)
Water storage loss:													
Store volume												210.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5800	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8532	(55)
Total storage loss													
	26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(56)
If cylinder contains dedicated solar storage													
	17.0031	15.3576	17.0031	16.4546	17.0031	16.4546	17.0031	17.0031	16.4546	17.0031	16.4546	17.0031	(57)
Primary loss	23.2624	21.0112	21.8667	15.7584	10.4681	9.9053	10.2355	11.1660	17.1091	21.8667	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	273.7058	241.7776	254.6841	216.4569	202.2805	179.7746	175.7677	184.9602	194.6712	223.4127	241.1469	270.4545	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Aperture area of solar collector												3.0000	(H1)
Zero-loss collector efficiency												0.8000	(H2)
Collector linear heat loss coefficient												1.8000	(H3)
Collector 2nd order heat loss coefficient												0.0000	(H4)
Collector loop efficiency												0.9000	(H5)
Incidence angle modifier												1.0000	(H6)
Overshading factor												0.8000	(H8)
Overall heat loss coefficient of system												6.5000	(H10)
Heat loss coefficient of collector loop												3.9667	(H11)
Dedicated solar storage volume												75.0000	(H12)
If combined cylinder, total volume of cylinder												210.0000	(H13)
Effective solar volume												115.5000	(H14)
Reference volume												225.0000	(H15)
Storage tank correction coefficient												1.1814	(H16)
Heat delivered to hot water												661.7243	(H24)
Heat delivered to space heating												0.0000	(H29)
Solar input												661.7243	
Solar input	-0.0000	-20.2144	-62.8139	-84.6635	-109.0628	-100.4582	-99.7212	-87.9174	-62.1691	-33.3828	-1.3210	-0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	273.7058	221.5632	191.8702	131.7934	93.2177	79.3164	76.0465	97.0428	132.5020	190.0299	239.8259	270.4545	(64)
										Total per year (kWh/year) = Sum(64)m =		1997.3683	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	109.8313	97.3935	102.8540	87.0315	80.1010	72.0983	71.1768	74.6683	80.4192	92.4563	98.3982	108.7502	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	41.8620	37.1814	30.2380	22.8921	17.1121	14.4468	15.6102	20.2908	27.2342	34.5801	40.3601	43.0254	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	426.1571	430.5793	419.4356	395.7119	365.7649	337.6190	318.8159	314.3937	325.5374	349.2611	379.2081	407.3540	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	(71)
Water heating gains (Table 5)													
	147.6227	144.9308	138.2447	120.8771	107.6627	100.1365	95.6677	100.3606	111.6933	124.2693	136.6642	146.1697	(72)
Total internal gains													
	727.9762	725.0259	700.2526	651.8154	602.8741	564.5367	542.4282	547.3794	576.7994	620.4449	668.5668	708.8835	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	5.8000	19.6403	0.3000	0.0000	0.7700	26.3140	(76)
South	2.3600	46.7521	0.3000	0.0000	0.7700	25.4874	(78)
West	2.8100	19.6403	0.3000	0.0000	0.7700	12.7487	(80)

Solar gains	64.5501	118.1567	179.0161	243.6322	287.5543	290.5234	278.0979	245.4860	201.9064	135.6952	78.9178	54.1467	(83)
Total gains	792.5262	843.1826	879.2687	895.4476	890.4284	855.0600	820.5261	792.8655	778.7058	756.1401	747.4846	763.0302	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	27.3061	27.4718	27.6395	28.5095	28.6901	29.6287	29.6287	29.8238	29.2460	28.6901	28.3311	27.9810	
alpha	2.8204	2.8315	2.8426	2.9006	2.9127	2.9752	2.9752	2.9883	2.9497	2.9127	2.8887	2.8654	
util living area													
	0.9205	0.9022	0.8692	0.8080	0.7146	0.5675	0.4339	0.4617	0.6425	0.8125	0.8941	0.9262	(86)
Living	19.0742	19.2949	19.6658	20.1584	20.5548	20.8475	20.9491	20.9381	20.7630	20.2709	19.6309	19.0701	
Non living	18.4937	18.7127	19.0781	19.5689	19.9446	20.2208	20.3003	20.2968	20.1447	19.6850	19.0600	18.5014	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.0148	19.2949	19.6658	20.1584	20.5548	20.8475	20.9491	20.9381	20.7630	20.2709	19.6309	19.3400	(87)
Th 2	20.2763	20.2804	20.2845	20.3048	20.3089	20.3294	20.3294	20.3336	20.3212	20.3089	20.3008	20.2926	(88)
util rest of house													
	0.9128	0.8928	0.8563	0.7885	0.6840	0.5216	0.3749	0.4033	0.5992	0.7900	0.8826	0.9191	(89)
MIT 2	19.3644	18.7127	19.0781	19.5689	19.9446	20.2208	20.3003	20.2968	20.1447	19.6850	19.0600	18.7519	(90)
Living area fraction											fLA = Living area / (4) =	0.2917	(91)

MIT	19.5542	18.8825	19.2496	19.7409	20.1227	20.4036	20.4896	20.4839	20.3251	19.8559	19.2266	18.9235	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5542	18.8825	19.2496	19.7409	20.1227	20.4036	20.4896	20.4839	20.3251	19.8559	19.2266	18.9235	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9042	0.8712	0.8348	0.7710	0.6752	0.5269	0.3893	0.4168	0.5995	0.7735	0.8619	0.9027	(94)
Useful gains	716.6284	734.6214	734.0434	690.4149	601.1826	450.5030	319.4479	330.4999	466.8113	584.8776	644.2932	688.8200	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1418.8071	1292.6897	1171.5499	965.7611	745.6101	497.4858	333.4170	347.7831	540.5983	819.3747	1087.0997	1336.4195	(97)
Space heating kWh													
	522.4209	375.0219	325.5048	198.2493	107.4540	0.0000	0.0000	0.0000	0.0000	174.4659	318.8207	481.8140	(98a)
Space heating requirement - total per year (kWh/year)												2503.7516	
Solar heating kWh													
	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	522.4209	375.0219	325.5048	198.2493	107.4540	0.0000	0.0000	0.0000	0.0000	174.4659	318.8207	481.8140	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2503.7516	
Space heating per m2											(98c) / (4) =	20.8230	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												281.3941	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	522.4209	375.0219	325.5048	198.2493	107.4540	0.0000	0.0000	0.0000	0.0000	174.4659	318.8207	481.8140	(98)
Space heating efficiency (main heating system 1)													
	281.3941	281.3941	281.3941	281.3941	281.3941	0.0000	0.0000	0.0000	0.0000	281.3941	281.3941	281.3941	(210)
Space heating fuel (main heating system)													
	185.6546	133.2728	115.6758	70.4525	38.1863	0.0000	0.0000	0.0000	0.0000	62.0006	113.3004	171.2239	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	273.7058	221.5632	191.8702	131.7934	93.2177	79.3164	76.0465	97.0428	132.5020	190.0299	239.8259	270.4545	(64)
Efficiency of water heater												279.7109	(216)
(217)m	279.7109	279.7109	279.7109	279.7109	279.7109	279.7109	279.7109	279.7109	279.7109	279.7109	279.7109	279.7109	(217)
Fuel for water heating, kWh/month													
	97.8531	79.2115	68.5959	47.1177	33.3265	28.3566	27.1875	34.6939	47.3711	67.9380	85.7406	96.6907	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	51.8101	46.7963	51.8101	50.1389	51.8101	50.1389	51.8101	51.8101	50.1389	51.8101	50.1389	51.8101	(231)
Lighting	36.6415	29.3952	26.4671	19.3909	14.9781	12.2373	13.6635	17.7604	23.0690	30.2678	34.1874	37.6599	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-38.4095	-57.3382	-86.7385	-101.1631	-110.6203	-101.0514	-99.8726	-93.0709	-80.9461	-66.6795	-43.0445	-32.7239	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-11.6770	-26.2417	-55.6077	-89.6089	-125.0625	-130.6623	-128.7789	-106.7030	-75.5170	-40.1664	-16.3653	-9.1899	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	889.7670	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	279.7109	
Water heating fuel used	714.0831	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.3580)		
mechanical ventilation fans (SFP = 1.3580)	530.0227	(230a)
pump for solar water heating	80.0000	(230g)
Total electricity for the above, kWh/year	610.0227	(231)
Electricity for lighting (calculated in Appendix L)	295.7182	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1727.2394	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	782.3516	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	889.7670	16.4900	146.7226	(240)

Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	714.0831	16.4900	117.7523	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	530.0227	16.4900	87.4007	(249)
Pump for solar water heating	80.0000	16.4900	13.1920	(249)
Energy for lighting	295.7182	16.4900	48.7639	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-911.6587	16.4900	-150.3325	
PV Unit electricity exported	-815.5807	5.5900	-45.5910	
Total			-195.9235	(252)
Total energy cost			217.9081	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.4747	(257)
SAP value		92.3044	
SAP rating (Section 12)		92	(258)
SAP band		A	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	889.7670	0.1549	137.8490	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	714.0831	0.1460	104.2886	(264)
Space and water heating			242.1376	(265)
Pumps, fans and electric keep-hot	610.0227	0.1387	84.6177	(267)
Energy for lighting	295.7182	0.1443	42.6813	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-911.6587	0.1340	-122.1876	
PV Unit electricity exported	-815.5807	0.1237	-100.8964	
Total			-223.0840	(269)
Total CO2, kg/year			146.3525	(272)
CO2 emissions per m2			1.2200	(273)
EI value			98.8132	
EI rating			99	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.0600	(1b) x	2.4800	(2b) =	116.7088	(1b) - (3b)
First floor	49.7800	(1c) x	2.7800	(2c) =	138.3884	(1c) - (3c)
Second floor	23.4000	(1d) x	2.7700	(2d) =	64.8180	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	120.2400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		319.9152	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.2500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2125	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.6000	4.5000	4.5000	4.1000	4.2000	3.7000	3.5000	3.5000	3.7000	4.1000	4.1000	4.2000	(22)
Wind factor	1.1500	1.1250	1.1250	1.0250	1.0500	0.9250	0.8750	0.8750	0.9250	1.0250	1.0250	1.0500	(22a)
Adj infilt rate	0.2444	0.2391	0.2391	0.2178	0.2231	0.1966	0.1859	0.1859	0.1966	0.2178	0.2178	0.2231	(22b)

Balanced mechanical ventilation with heat recovery		
If mechanical ventilation		0.5000 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 80.1000 (23c)

Effective ac	0.3439	0.3386	0.3386	0.3173	0.3226	0.2961	0.2854	0.2854	0.2961	0.3173	0.3173	0.3226	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Door			4.1400	1.0000	4.1400			(26)
Window			10.9700	0.7752	8.5039			(27)
GF			47.0600	0.0900	4.2354	75.0000	3529.5000	(28a)
Exposed Floor			2.7200	0.1400	0.3808	20.0000	54.4000	(28b)
Main	136.0800	15.1100	120.9700	0.1300	15.7261	9.0000	1088.7300	(29a)
Dwarf Wall (PIRx0.72)	16.7700		16.7700	0.0900	1.5093	9.0000	150.9300	(29a)
PIJ	15.5100		15.5100	0.1300	2.0163	9.0000	139.5900	(30)
PIR	12.2300		12.2300	0.1300	1.5899	9.0000	110.0700	(30)
Residual Ceiling	26.3800		26.3800	0.0900	2.3742	9.0000	237.4200	(30)
Total net area of external elements Aum(A, m2)			256.7500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		40.4759			(33)
Main dwelling								
Party Wall 1			40.6300	0.0000	0.0000	20.0000	812.6000	(32)
Timber			124.1700			9.0000	1117.5300	(32c)
FF			47.0600			18.0000	847.0800	(32d)
SF			23.4000			18.0000	421.2000	(32d)
GF			47.0600			9.0000	423.5400	(32e)
FF			23.4000			9.0000	210.6000	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 9143.1900 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 76.0412 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	10.6900	0.1150	1.2293
E3 Sill	10.6900	0.0170	0.1817
E4 Jamb	35.4000	0.0940	3.3276
E5 Ground floor (normal)	22.8600	0.0670	1.5316
E11 Eaves (insulation at rafter level)	18.1000	0.0250	0.4525
E16 Corner (normal)	29.0400	0.0680	1.9747
E12 Gable (insulation at ceiling level)	5.6600	0.0770	0.4358
E6 Intermediate floor within a dwelling	39.5500	0.0320	1.2656
E17 Corner (inverted - internal area greater than external area)	2.4800	-0.0290	-0.0719
P1 Party wall - Ground floor	6.2400	0.3200	1.9968
E20 Exposed floor (normal)	3.3800	0.0790	0.2670
E21 Exposed floor (inverted)	3.3800	0.0630	0.2129
E13 Gable (insulation at rafter level)	8.2800	0.0740	0.6127
E18 Party wall between dwellings	5.5600	0.0920	0.5115
R6 Flat ceiling	18.1000	-0.0430	-0.7783
E25 Staggered party wall between dwellings	4.9600	0.0560	0.2778

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 13.4275 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 53.9034 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	36.3036	35.7427	35.7427	33.4993	34.0602	31.2559	30.1342	30.1342	31.2559	33.4993	33.4993	34.0602	(38)
Heat transfer coeff	90.2069	89.6461	89.6461	87.4027	87.9635	85.1593	84.0376	84.0376	85.1593	87.4027	87.4027	87.9635	(39)
Average = Sum(39)m / 12 =												87.1690	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7502	0.7456	0.7456	0.7269	0.7316	0.7082	0.6989	0.6989	0.7082	0.7269	0.7269	0.7316	(40)
HLP (average)												0.7250	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.8642 (42)
Hot water usage for mixer showers

72.2437	71.1580	69.5759	66.5490	64.3151	61.8240	60.4080	61.9781	63.6992	66.3739	69.4659	71.9669	(42a)

Hot water usage for baths

31.1904	30.7271	30.0748	28.8721	27.9715	26.9729	26.4334	27.0812	27.7865	28.8550	30.0826	31.0849	(42b)

Hot water usage for other uses

43.9627	42.3640	40.7654	39.1667	37.5681	35.9694	35.9694	37.5681	39.1667	40.7654	42.3640	43.9627	(42c)

Average daily hot water use (litres/day) 135.4907 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	147.3967	144.2491	140.4161	134.5878	129.8547	124.7663	122.8109	126.6274	130.6524	135.9943	141.9125	147.0144	(44)
Energy conte	233.4403	205.4088	215.8143	184.2439	174.8094	153.4147	148.5292	156.7911	161.1075	184.5430	202.1803	230.1891	(45)
Energy content (annual)										Total = Sum(45)m =		2250.4717	
Distribution loss (46)m = 0.15 x (45)m	35.0160	30.8113	32.3722	27.6366	26.2214	23.0122	22.2794	23.5187	24.1661	27.6815	30.3271	34.5284	(46)
Water storage loss:													
Store volume												210.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5800	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8532	(55)
Total storage loss	26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(56)
If cylinder contains dedicated solar storage	17.0031	15.3576	17.0031	16.4546	17.0031	16.4546	17.0031	17.0031	16.4546	17.0031	16.4546	17.0031	(57)
Primary loss	23.2624	21.0112	21.8667	15.7584	10.4681	9.9053	10.2355	11.1660	17.1091	21.8667	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	273.7058	241.7776	254.6841	216.4569	202.2805	179.7746	175.7677	184.9602	194.6712	223.4127	241.1469	270.4545	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)

Aperture area of solar collector 3.0000 (H1)
Zero-loss collector efficiency 0.8000 (H2)
Collector linear heat loss coefficient 1.8000 (H3)
Collector 2nd order heat loss coefficient 0.0000 (H4)
Collector loop efficiency 0.9000 (H5)
Incidence angle modifier 1.0000 (H6)
Overshading factor 0.8000 (H8)

Overall heat loss coefficient of system												6.5000	(H10)
Heat loss coefficient of collector loop												3.9667	(H11)
Dedicated solar storage volume												75.0000	(H12)
If combined cylinder, total volume of cylinder												210.0000	(H13)
Effective solar volume												115.5000	(H14)
Reference volume												225.0000	(H15)
Storage tank correction coefficient												1.1814	(H16)
Heat delivered to hot water												605.2985	(H24)
Heat delivered to space heating												0.0000	(H29)
Solar input												605.2985	
Solar input	-0.0000	-14.4753	-57.1346	-80.0537	-101.5431	-95.3649	-92.1367	-79.1730	-57.3788	-28.0385	-0.0000	-0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	273.7058	227.3023	197.5495	136.4032	100.7374	84.4097	83.6309	105.7872	137.2924	195.3743	241.1469	270.4545	(64)
											Total per year (kWh/year) = Sum(64)m =	2053.7941	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
											Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	0.0000	(64a)
Heat gains from water heating, kWh/month													
	109.8313	97.3935	102.8540	87.0315	80.1010	72.0983	71.1768	74.6683	80.4192	92.4563	98.3982	108.7502	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	171.8542	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	41.8620	37.1814	30.2380	22.8921	17.1121	14.4468	15.6102	20.2908	27.2342	34.5801	40.3601	43.0254	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	426.1571	430.5793	419.4356	395.7119	365.7649	337.6190	318.8159	314.3937	325.5374	349.2611	379.2081	407.3540	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	55.0497	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	-114.5695	(71)
Water heating gains (Table 5)													
	147.6227	144.9308	138.2447	120.8771	107.6627	100.1365	95.6677	100.3606	111.6933	124.2693	136.6642	146.1697	(72)
Total internal gains													
	727.9762	725.0259	700.2526	651.8154	602.8741	564.5367	542.4282	547.3794	576.7994	620.4449	668.5668	708.8835	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	5.8000	16.6187	0.3000	0.0000	0.7700	22.2657	(76)
South	2.3600	39.5594	0.3000	0.0000	0.7700	21.5662	(78)
West	2.8100	16.6187	0.3000	0.0000	0.7700	10.7874	(80)

Solar gains	54.6193	105.0282	167.8276	232.2627	268.0845	275.9972	258.9695	225.1592	191.3721	125.4152	69.3520	48.9899	(83)
Total gains	782.5955	830.0541	868.0802	884.0781	870.9586	840.5339	801.3977	772.5386	768.1715	745.8601	737.9188	757.8733	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	28.1550	28.3311	28.3311	29.0583	28.8730	29.8238	30.2219	30.2219	29.8238	29.0583	29.0583	28.8730	
alpha	2.8770	2.8887	2.8887	2.9372	2.9249	2.9883	3.0148	3.0148	2.9883	2.9372	2.9372	2.9249	
util living area													
	0.9165	0.8976	0.8659	0.7975	0.6952	0.5455	0.4361	0.4588	0.6420	0.8083	0.8880	0.9215	(86)
Living	19.2196	19.4305	19.7434	20.2407	20.6188	20.8734	20.9509	20.9424	20.7721	20.3098	19.7454	19.2245	
Non living	18.6514	18.8606	19.1658	19.6571	20.0069	20.2460	20.3135	20.3079	20.1634	19.7284	19.1839	18.6681	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.0892	19.4305	19.7434	20.2407	20.6188	20.8734	20.9509	20.9424	20.7721	20.3098	19.7454	19.4729	(87)
Th 2	20.2967	20.3008	20.3008	20.3171	20.3130	20.3336	20.3418	20.3418	20.3336	20.3171	20.3171	20.3130	(88)
util rest of house													
	0.9085	0.8878	0.8528	0.7769	0.6620	0.4972	0.3778	0.3998	0.5993	0.7852	0.8759	0.9140	(89)
MIT 2	19.4550	18.8606	19.1658	19.6571	20.0069	20.2460	20.3135	20.3079	20.1634	19.7284	19.1839	18.8982	(90)
Living area fraction											fLA = Living area / (4) =	0.2917	(91)
MIT	19.6400	19.0269	19.3343	19.8273	20.1854	20.4290	20.4995	20.4931	20.3410	19.8980	19.3477	19.0659	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6400	19.0269	19.3343	19.8273	20.1854	20.4290	20.4995	20.4931	20.3410	19.8980	19.3477	19.0659	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9001	0.8668	0.8320	0.7607	0.6554	0.5044	0.3921	0.4138	0.5998	0.7694	0.8558	0.8978	(94)
Useful gains	704.3904	719.5206	722.2056	672.5359	570.8028	423.9277	314.2625	319.6414	460.7224	573.8547	631.4934	680.4151	(95)
Ext temp.	4.7000	5.3000	6.7000	9.3000	12.3000	15.0000	16.6000	16.5000	14.1000	10.8000	7.5000	4.6000	(96)
Heat loss rate W													
	1347.6940	1230.5591	1132.6162	920.1184	693.6316	462.3306	327.7036	335.5662	531.4779	795.1929	1035.5250	1272.4682	(97)
Space heating kWh													
	478.6179	343.4179	305.3455	178.2594	91.3846	0.0000	0.0000	0.0000	0.0000	164.6756	290.9028	440.4875	(98a)
Space heating requirement - total per year (kWh/year)												2293.0912	
Solar heating kWh													
	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	478.6179	343.4179	305.3455	178.2594	91.3846	0.0000	0.0000	0.0000	0.0000	164.6756	290.9028	440.4875	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2293.0912	
Space heating per m2											(98c) / (4) =	19.0710	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												280.5326	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	478.6179	343.4179	305.3455	178.2594	91.3846	0.0000	0.0000	0.0000	0.0000	164.6756	290.9028	440.4875	(98)
Space heating efficiency (main heating system 1)													
	280.5326	280.5326	280.5326	280.5326	280.5326	0.0000	0.0000	0.0000	0.0000	280.5326	280.5326	280.5326	(210)
Space heating fuel (main heating system)													
	170.6104	122.4164	108.8449	63.5432	32.5754	0.0000	0.0000	0.0000	0.0000	58.7011	103.6966	157.0183	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	273.7058	227.3023	197.5495	136.4032	100.7374	84.4097	83.6309	105.7872	137.2924	195.3743	241.1469	270.4545	(64)
Efficiency of water heater												279.7193	(216)
(217)m	279.7193	279.7193	279.7193	279.7193	279.7193	279.7193	279.7193	279.7193	279.7193	279.7193	279.7193	279.7193	(217)
Fuel for water heating, kWh/month													
	97.8502	81.2609	70.6242	48.7643	36.0138	30.1766	29.8982	37.8191	49.0822	69.8466	86.2103	96.6878	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	51.8101	46.7963	51.8101	50.1389	51.8101	50.1389	51.8101	51.8101	50.1389	51.8101	50.1389	51.8101	(231)
Lighting	36.6415	29.3952	26.4671	19.3909	14.9781	12.2373	13.6635	17.7604	23.0690	30.2678	34.1874	37.6599	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-33.1246	-51.9604	-82.4700	-97.5946	-105.6422	-98.2912	-96.1020	-88.5158	-78.2179	-62.7439	-38.5182	-29.8985	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-9.2562	-22.3330	-50.9796	-84.2748	-114.0829	-121.8368	-116.8222	-94.7163	-70.0819	-36.0076	-13.6904	-8.0236	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												817.4063	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												279.7193	
Water heating fuel used												734.2340	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.3580)													
mechanical ventilation fans (SFP = 1.3580)												530.0227	(230a)
pump for solar water heating												80.0000	(230g)
Total electricity for the above, kWh/year												610.0227	(231)
Electricity for lighting (calculated in Appendix L)												295.7182	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1605.1846	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												852.1966	(238)

10a. Fuel costs - using BEDF prices (583)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	817.4063	28.4300	232.3886	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	734.2340	28.4300	208.7427	(247)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(247a)
Pumps, fans and electric keep-hot	530.0227	28.4300	150.6855	(249)
Pump for solar water heating	80.0000	28.4300	22.7440	(249)
Energy for lighting	295.7182	28.4300	84.0727	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-863.0793	28.4300	-245.3735	
PV Unit electricity exported	-742.1053	5.8100	-43.1163	
Total			-288.4898	(252)
Total energy cost			410.1437	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	817.4063	0.1550	126.6715	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	734.2340	0.1456	106.9246	(264)
Space and water heating			233.5961	(265)
Pumps, fans and electric keep-hot	610.0227	0.1387	84.6177	(267)

Energy for lighting	295.7182	0.1443	42.6813	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-863.0793	0.1337	-115.3732	
PV Unit electricity exported	-742.1053	0.1235	-91.6330	
Total			-207.0062	(269)
Total CO2, kg/year			153.8889	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	817.4063	1.5737	1286.3598	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	734.2340	1.5387	1129.7567	(278)
Space and water heating			2416.1164	(279)
Pumps, fans and electric keep-hot	610.0227	1.5128	922.8423	(281)
Energy for lighting	295.7182	1.5338	453.5824	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-863.0793	1.4940	-1289.4486	
PV Unit electricity exported	-742.1053	0.4532	-336.2972	
Total			-1625.7458	(283)
Total Primary energy kWh/year			2166.7954	(286)

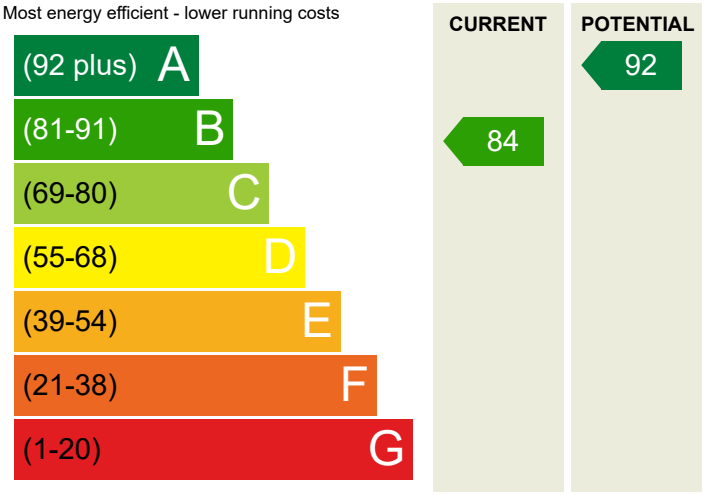
Energy Report

Dwelling Address	820 Rochdale Road, MANCHESTER, M9 8FA
Reference	78449-18-001
Assessment Date	02/07/2025
Submission Date	
Property Type	House, End-Terrace
Total Floor Area	120

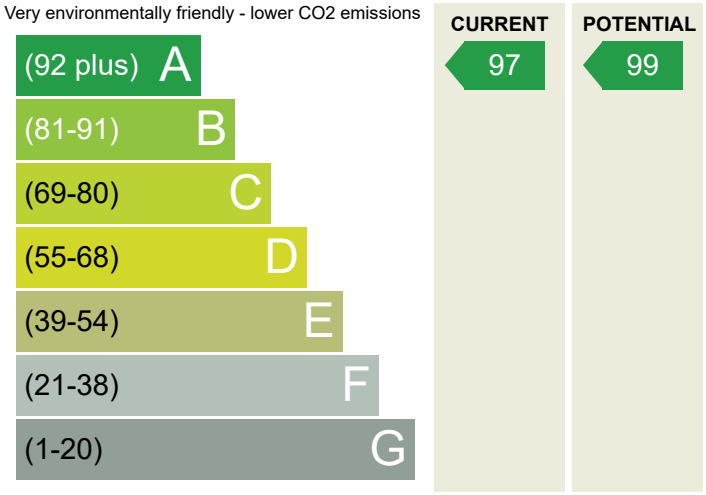
This Energy Report has been generated using the UK's National Calculation Methodology for dwellings, Standard Assessment Procedure (SAP). This methodology is used to assess the energy efficiency of dwellings which is calculated based on a dwelling's heating, hot water, ventilation and lighting usage.

This document is not an Energy Performance Certificate (EPC) as required by the Energy Performance of Buildings Regulations

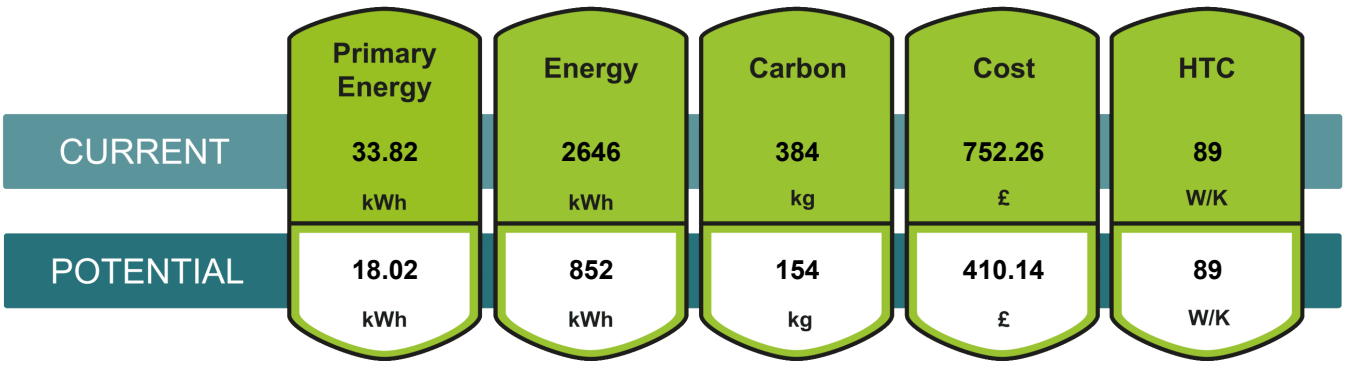
Energy Efficiency Rating



Carbon Dioxide (CO2) Emissions Rating



Additional ratings for your home



Energy Report

Breakdown of property's energy performance

Each feature is assessed as one of the following:

Very Poor | Poor | Average | Good | Very Good

Feature	Description	Energy Performance
Walls	Average thermal transmittance 0.13 W/m²K	Very Good
Roof	Average thermal transmittance 0.11 W/m²K	Very Good
Floor	Average thermal transmittance 0.09 W/m²K	Very Good
Windows	High performance glazing	Very Good
Main heating	Air source heat pump, radiators, electric	Good
Main heating controls	Programmer, room thermostat and TRVs	Good
Secondary heating	None	
Hot water	From main system	Good
Lighting	Good lighting efficiency	Good
Air tightness	Air permeability [AP50] = 5.0 m³/h.m² (as tested)	Good

Recommendations

The recommended measures provided below will help to improve the energy efficiency of the dwelling.
To reach the dwelling's potential energy rating all of the recommended measures shown below would need to be installed.
Having these measures installed individually or in any other order may give a different result when compared with the cumulative potential rating.

Recommended measures	Cumulative savings (per year)	Cumulative rating	Typical costs	Incremental savings (per year)	Cumulative CO2 rating
Solar water heating	£54	B 85	£4,000 - £7,000	£54	A 97
Photovoltaic	£342	A 92	£8,000 - £10,000	£288	A 99

Energy Report

The typical cost is based on average installation prices across the country so may not be representative of the actual costs in your area.

Estimated energy costs of the dwelling

The table below shows the estimated running costs of the space and water heating and lighting within the dwelling. It does not include the energy used from household appliances. The estimated annual costs after potential improvements indicates the total energy cost if all recommended measures named above were installed.

	Estimated annual costs	Estimated annual costs after potential improvements	Potential future savings
Lighting	£84	£84	
Heating	£380	£406	
Hot Water	£288	£209	
New Technologies e.g. Impact of PV	£0	-(£288)	
TOTAL	£752	£410	

Estimated energy use and potential savings

Space Heating
806
kWh per year

Water Heating
1014
kWh per year

Energy Report

About this document

Created by:	
Company/Trading name:	
Phone number:	
Email address:	

Disclaimer

This Energy Report should not under any circumstances be treated as a Condition Survey and cannot be used to indicate that any element of the dwelling (e.g.heating system) is working correctly.
This Energy Report must not be used in situations where an Energy Performance Certificate (EPC) is required.
This Energy Report is generated from a set of data inputs which may not reflect the actual dimensions, services or construction of the dwelling.
The calculation used to generate this report reflects the SAP Methodology current at the time of report generation.

Glossary terms for additional metrics

Primary Energy	The measure of the energy required for lighting, heating and hot water in a property. This includes the efficiency of the property's heating system, power station efficiency for electricity and the energy used to produce the fuel and deliver it to the property.
Energy Used	The estimated amount of fuel energy for lighting, heating and hot water for the property. The estimate is based on typical usage which is likely to be different to actual consumption.
Carbon (CO2)	The current emissions based on the energy estimates.
Cost	The estimated cost of energy. The cost of each unit of fuel is based on an industry standard which is likely to be different to those the occupier actually pays.
Heat Transfer Coefficient	Heat flow through the property envelope where internal and external temperatures are different.

Building Regulations England Part L (BREL) Compliance Report

Approved Document L1 2021 Edition, England assessed by Array SAP 10 program, Array

Date: Fri 03 Oct 2025 15:03:29

Project Information			
Assessed By	Paul Goddard	Building Type	Flat, End-terrace
OCDEA Registration	EES/005113	Assessment Date	2025-10-03

Dwelling Details			
Assessment Type	As built	Total Floor Area	38 m^2
Site Reference	78449-19	Plot Reference	001
Address	12 Shepherd Street, MANCHESTER, M9 4QW		

Client Details	
Name	-
Company	John Southworth
Address	Unit 10, Charles Street, DUKINFIELD, SK16 4SD

This report covers items included within the SAP calculations. It is not a complete report of regulations compliance.

1a Target emission rate and dwelling emission rate		
Fuel for main heating system	Electricity	
Target carbon dioxide emission rate	*16.8 kgCO_2/m^2*	
Dwelling carbon dioxide emission rate	4.79 kgCO_2/m^2	OK
1b Target primary energy rate and dwelling primary energy		
Target primary energy	*88.97 kWh$_{PE}$/m^2*	
Dwelling primary energy	50.4 kWh$_{PE}$/m^2	OK
1c Target fabric energy efficiency and dwelling fabric energy efficiency		
Target fabric energy efficiency	*40.3 kWh/m^2*	
Dwelling fabric energy efficiency	28.2 kWh/m^2	OK

2a Fabric U-values				
Element	***Maximum permitted average U-Value [W/m^2K]***	**Dwelling average U-Value [W/m^2K]**	**Element with highest individual U-Value**	
External walls	*0.26*	0.13	Walls (1) (0.13)	OK
Party walls	*0.2*	0	Party Wall (1) (0)	**N/A**
Curtain walls	*1.6*	0	N/A	**N/A**
Floors	*0.18*	0.09	GF (0.09)	OK
Roofs	*0.16*	N/A	N/A	**N/A**
Windows, doors, and roof windows	*1.6*	0.76	Front (0.78)	OK
Rooflights	*2.2*	N/A	N/A	**N/A**

2b Envelope elements (better than typically expected values are flagged with a subsequent (!))		
Name	**Net area [m^2]**	**U-Value [W/m^2K]**
Exposed wall: Walls (1)	43.82	0.13 **(!)**
Party wall: Party Wall (1)	14.87	0 **(!)**
Ground floor: GF, GF	37.97	0.09 **(!)**

2c Openings (better than typically expected values are flagged with a subsequent (!))				
Name	**Area [m^2]**	**Orientation**	**Frame factor**	**U-Value [W/m^2K]**
Front, Door	2.15	South	N/A	0.78 **(!)**
Front, Window	2.81	South	1.0	0.75 **(!)**
Rear, Window	1.66	North	1.0	0.75 **(!)**
Side, Window	0.72	West	1.0	0.75 **(!)**

2d Thermal bridging (better than typically expected values are flagged with a subsequent (!))				
Building part **1**: Thermal bridging calculated from linear thermal transmittances for each junction				
Main element	**Junction detail**	**Source**	**Psi value [W/mK]**	**Drawing / reference**
External wall	E2: Other lintels (including other steel lintels)	Calculated by person with suitable expertise	0.115	Thermal Bridge Report
External wall	E3: Sill	Calculated by person with suitable expertise	0.017 **(!)**	Thermal Bridge Report
External wall	E4: Jamb	Calculated by person with suitable	0.094	Thermal Bridge

Main element	Junction detail	Source	Psi value [W/mK]	Drawing / reference
		expertise		Report
External wall	E5: Ground floor (normal)	Calculated by person with suitable expertise	0.067	Thermal Bridge Report
External wall	E7: Party floor between dwellings (in blocks of flats)	Calculated by person with suitable expertise	0.032 **(!)**	Thermal Bridge Report
External wall	E16: Corner (normal)	Calculated by person with suitable expertise	0.068	Thermal Bridge Report
External wall	E17: Corner (inverted - internal area greater than external area)	Calculated by person with suitable expertise	-0.029 **(!)**	Thermal Bridge Report
Party wall	P1: Ground floor	Calculated by person with suitable expertise	0.056	Thermal Bridge Report
External wall	E18: Party wall between dwellings	SAP table default	0.24	Thermal Bridge Report
External wall	E25: Staggered party wall between dwellings	Calculated by person with suitable expertise	0.056	Thermal Bridge Report

3 Air permeability (better than typically expected values are flagged with a subsequent (!))		
Maximum permitted air permeability at 50Pa	*8 m^3/hm^2*	
Dwelling air permeability at 50Pa	3.35 m^3/hm^2, Measured value **(!)**	OK
Air permeability test certificate reference		

4 Space heating	
Main heating system 1: Room heaters - Electricity	
Efficiency	100.0%
Emitter type	
Flow temperature	
System type	Panel, convector or radiant heaters
Manufacturer	
Model	
Commissioning	
Main heating system 2: Heat pump with radiators or underfloor heating - Electricity	
Efficiency	0.0%
Emitter type	
Flow temperature	
System type	Heat Pump
Manufacturer	Vaillant Group UK Ltd
Model	aroSTOR 200ltr
Commissioning	
Secondary heating system: N/A	
Fuel	N/A
Efficiency	N/A
Commissioning	

5 Hot water	
Cylinder/store - type: N/A	
Capacity	N/A
Declared heat loss	N/A
Primary pipework insulated	N/A
Manufacturer	
Model	
Commissioning	
Waste water heat recovery system 1 - type: N/A	
Efficiency	
Manufacturer	
Model	

6 Controls	
Main heating 1 - type: Programmer and room thermostats	
Function	
Ecodesign class	
Manufacturer	
Model	

Main heating 2 - type: Not applicable		
Function		
Ecodesign class		
Manufacturer		
Model		
Water heating - type: Cylinder thermostat and HW separately timed		
Manufacturer		
Model		

7 Lighting		
Minimum permitted light source efficacy	*75 lm/W*	
Lowest light source efficacy	75 lm/W	**OK**
External lights control	N/A	

8 Mechanical ventilation		
System type: Balanced whole-house mechanical ventilation with heat recovery		
Maximum permitted specific fan power	*1.5 W/(l/s)*	
Specific fan power	0.87 W/(l/s)	**OK**
Minimum permitted heat recovery efficiency	*73%*	
Heat recovery efficiency	89%	**OK**
Manufacturer/Model	DV96 Adroit	
Commissioning		

9 Local generation
N/A

10 Heat networks
N/A

11 Supporting documentary evidence	
Documentary evidence identified in 11.1 and 11.2 is needed to confirm the data values used for any calculations undertaken, manufacturer declarations made, and tests performed as reflected in this "As built" BREL Compliance Report are correct. 11.1 SAP Conventions, Appendix 1 (documentary evidence) schedules the minimum documentary evidence required. 11.2 Indicative photographic evidence of key stages during construction (guidance within Approved Document L, Volume 1 – Appendix B) that confirms the products identified in this BREL Compliance Report are used in this dwelling, and workmanship is of sufficient quality to support the calculated values claimed in 2a to 2d.	

12 Declarations	
a. Assessor Declaration	
This declaration by the assessor is confirmation that the contents of this BREL Compliance Report are a true and accurate reflection based upon the design and construction information submitted for this dwelling for the purpose of carrying out the assessment, and that the supporting documentary evidence (identified in 11.1 and 11.2) pursuant to Part L of the Building Regulations 2010 (as amended) has been reviewed in the course of preparing this BREL Compliance Report.	
Signed: Name:	Assessor ID: Date:
b. Client Declaration	
This declaration by the client is confirmation that the dwelling has been constructed and completed according to the specifications set out in this BREL Compliance Report, and that photographic evidence of key stages, as described in 11.2, has been provided to the Assessor for this dwelling.	
Signed: Name:	Organisation: Date:

Full SAP Calculation Printout

Property Reference	78449-19	**Issued on Date**	03/10/2025
Assessment Reference	001	**Prop Type Ref**	GF Flat / Mid
Property	12 Shepherd Street, MANCHESTER, M9 4QW		

SAP Rating	86 B	**DER**	4.79	**TER**	16.80
Environmental	97 A	**% DER < TER**			71.49
CO_2 Emissions (t/year)	0.17	**DFEE**	28.20	**TFEE**	40.27
Compliance Check	See BREL	**% DFEE < TFEE**			29.98
% DPER < TPER	43.35	**DPER**	50.40	**TPER**	88.97

Assessor Details	Mr. Daniel Goddard	**Assessor ID**	CP52-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	37.9700	(1b)	x 2.3600	(2b) =	89.6092	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	37.9700					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	89.6092	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.3500	(17)
Infiltration rate		0.1675	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1424	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1815	0.1780	0.1744	0.1566	0.1531	0.1353	0.1353	0.1317	0.1424	0.1531	0.1602	0.1673	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	80.1000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2810	0.2775	0.2739	0.2561	0.2526	0.2348	0.2348	0.2312	0.2419	0.2526	0.2597	0.2668	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door			2.1500	0.7800	1.6770			(26)
Window			5.1900	0.7282	3.7791			(27)
GF			37.9700	0.0900	3.4173	75.0000	2847.7500	(28a)
Main	51.1600	7.3400	43.8200	0.1300	5.6966	9.0000	394.3800	(29a)
Total net area of external elements Aum(A, m2)			89.1300					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	14.5700			(33)
Main dwelling								
Party Wall 1			14.8700	0.0000	0.0000	20.0000	297.4000	(32)
Party Ceiling			37.9700			20.0000	759.4000	(32b)
Timber			50.4000			9.0000	453.6000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 4752.5300	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	125.1654	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total

E2 Other lintels (including other steel lintels)	5.7900	0.1150	0.6659	
E3 Sill	5.7900	0.0170	0.0984	
E4 Jamb	12.9000	0.0940	1.2126	
E5 Ground floor (normal)	20.3000	0.0670	1.3601	
E7 Party floor between dwellings (in blocks of flats)	20.3000	0.0320	0.6496	
E16 Corner (normal)	12.6000	0.0680	0.8568	
E17 Corner (inverted - internal area greater than external area)	2.5200	-0.0290	-0.0731	
P1 Party wall - Ground floor	5.9000	0.0560	0.3304	
E18 Party wall between dwellings	2.5200	0.2400	0.6048	
E25 Staggered party wall between dwellings	2.5200	0.0560	0.1411	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.8466 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 20.4166 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	8.3103	8.2050	8.0998	7.5735	7.4683	6.9420	6.9420	6.8367	7.1525	7.4683	7.6788	7.8893	(38)
Heat transfer coeff	28.7269	28.6217	28.5164	27.9902	27.8849	27.3586	27.3586	27.2534	27.5691	27.8849	28.0954	28.3059	(39)
Average = Sum(39)m / 12 =												27.9638	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7566	0.7538	0.7510	0.7372	0.7344	0.7205	0.7205	0.7178	0.7261	0.7344	0.7399	0.7455	(40)
HLP (average)												0.7365	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.3535 (42)

Hot water usage for mixer showers

46.9130	46.2079	45.1806	43.2150	41.7644	40.1467	39.2272	40.2468	41.3644	43.1013	45.1092	46.7332	(42a)

Hot water usage for baths

20.2973	19.9959	19.5714	18.7887	18.2026	17.5528	17.2017	17.6233	18.0822	18.7776	19.5764	20.2287	(42b)

Hot water usage for other uses

28.4911	27.4550	26.4190	25.3830	24.3469	23.3109	23.3109	24.3469	25.3830	26.4190	27.4550	28.4911	(42c)

Average daily hot water use (litres/day) 87.9720 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	95.7014	93.6589	91.1710	87.3866	84.3139	81.0104	79.7399	82.2170	84.8296	88.2979	92.1406	95.4530	(44)
Energy conte	151.5676	133.3690	140.1264	119.6279	113.5028	99.6117	96.4385	101.8018	104.6034	119.8195	131.2712	149.4563	(45)
Energy content (annual)											Total = Sum(45)m =	1461.1961	
Distribution loss (46)m = 0.15 x (45)m	22.7351	20.0053	21.0190	17.9442	17.0254	14.9418	14.4658	15.2703	15.6905	17.9729	19.6907	22.4185	(46)

Water storage loss:
Store volume 200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.6100 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.8694 (55)
Total storage loss

26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)

If cylinder contains dedicated solar storage

26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

178.5190	157.7122	167.0778	145.7099	140.4542	125.6937	123.3899	128.7532	130.6854	146.7709	157.3532	176.4077	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

178.5190	157.7122	167.0778	145.7099	140.4542	125.6937	123.3899	128.7532	130.6854	146.7709	157.3532	176.4077	(64)
									Total per year (kWh/year) = Sum(64)m =		1778.5271	(64)
12Total per year (kWh/year)											1779	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)

Heat gains from water heating, kWh/month

50.3962	44.3452	46.5920	39.7763	37.7397	33.1209	32.0658	33.8491	34.7806	39.8400	43.6477	49.6942	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	65.2504	72.2415	65.2504	67.4254	65.2504	67.4254	65.2504	65.2504	67.4254	65.2504	67.4254	65.2504	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	116.4640	117.6725	114.6270	108.1436	99.9594	92.2675	87.1288	85.9203	88.9657	95.4491	103.6333	111.3253	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		(70)
Losses e.g. evaporation (negative values) (Table 5)	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	(71)
Water heating gains (Table 5)	67.7369	65.9899	62.6237	55.2449	50.7254	46.0012	43.0992	45.4961	48.3064	53.5483	60.6218	66.7933	(72)
Total internal gains	292.7535	299.2062	285.8035	274.1162	259.2375	248.9965	238.7807	239.9691	247.9999	257.5502	274.9828	286.6713	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	1.6600	10.6334	0.3800	0.0000	0.7700	5.1648	(74)
South	2.8100	46.7521	0.3800	0.0000	0.7700	38.4398	(78)
West	0.7200	19.6403	0.3800	0.0000	0.7700	4.1377	(80)

Solar gains	47.7423	80.9189	110.2947	137.0162	154.5638	154.1328	148.2996	134.9674	119.4394	89.2559	57.0949	40.9238	(83)
Total gains	340.4958	380.1251	396.0981	411.1324	413.8013	403.1293	387.0802	374.9364	367.4393	346.8061	332.0777	327.5951	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	45.9550	46.1240	46.2943	47.1647	47.3427	48.2534	48.2534	48.4398	47.8850	47.3427	46.9880	46.6386	
alpha	4.0637	4.0749	4.0863	4.1443	4.1562	4.2169	4.2169	4.2293	4.1923	4.1562	4.1325	4.1092	
util living area	0.9125	0.8718	0.8203	0.7208	0.5898	0.4269	0.3094	0.3322	0.5014	0.7281	0.8644	0.9210	(86)
MIT	20.1057	20.3147	20.5304	20.7744	20.9187	20.9840	20.9968	20.9956	20.9679	20.8001	20.4494	20.0767	(87)
Th 2	20.2911	20.2936	20.2960	20.3081	20.3106	20.3227	20.3227	20.3252	20.3179	20.3106	20.3057	20.3008	(88)
util rest of house	0.9018	0.8574	0.8006	0.6930	0.5533	0.3839	0.2624	0.2843	0.4561	0.6959	0.8471	0.9111	(89)
MIT 2	19.2570	19.5142	19.7771	20.0731	20.2342	20.3104	20.3209	20.3226	20.2917	20.1091	19.6930	19.2291	(90)
Living area fraction										fLA = Living area / (4) =		0.4772	(91)
MIT	19.6620	19.8962	20.1366	20.4078	20.5608	20.6319	20.6434	20.6438	20.6144	20.4389	20.0540	19.6336	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6620	19.8962	20.1366	20.4078	20.5608	20.6319	20.6434	20.6438	20.6144	20.4389	20.0540	19.6336	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8911	0.8485	0.7959	0.6972	0.5668	0.4037	0.2847	0.3070	0.4760	0.7021	0.8402	0.9005	(94)
Useful gains	303.4057	322.5237	315.2637	286.6253	234.5288	162.7478	110.2203	115.1027	174.9161	243.4972	279.0101	294.9977	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	441.3039	429.2165	388.8677	322.1047	247.0832	165.0244	110.6226	115.6568	179.5962	274.3564	363.9472	436.8622	(97)
Space heating kWh	102.5963	71.6976	54.7614	25.5451	9.3404	0.0000	0.0000	0.0000	0.0000	22.9592	61.1547	105.5472	(98a)
Space heating requirement - total per year (kWh/year)												453.6019	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	102.5963	71.6976	54.7614	25.5451	9.3404	0.0000	0.0000	0.0000	0.0000	22.9592	61.1547	105.5472	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												453.6019	
Space heating per m2											(98c) / (4) =	11.9463	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	102.5963	71.6976	54.7614	25.5451	9.3404	0.0000	0.0000	0.0000	0.0000	22.9592	61.1547	105.5472	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	102.5963	71.6976	54.7614	25.5451	9.3404	0.0000	0.0000	0.0000	0.0000	22.9592	61.1547	105.5472	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	178.5190	157.7122	167.0778	145.7099	140.4542	125.6937	123.3899	128.7532	130.6854	146.7709	157.3532	176.4077	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month	55.0102	48.5986	51.4846	44.9001	43.2806	38.7322	38.0223	39.6750	40.2704	45.2271	48.4880	54.3596	(219)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	11.3091	10.2147	11.3091	10.9443	11.3091	10.9443	11.3091	11.3091	10.9443	11.3091	10.9443	11.3091	(231)
Lighting	13.0684	10.4840	9.4397	6.9159	5.3420	4.3645	4.8732	6.3343	8.2277	10.7952	12.1931	13.4316	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												453.6019	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												324.5200	
Water heating fuel used												548.0485	(219)
Space cooling fuel												0.0000	(221)

Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.2180)		
mechanical ventilation fans (SFP = 1.2180)	133.1557	(230a)
Total electricity for the above, kWh/year	133.1557	(231)
Electricity for lighting (calculated in Appendix L)	105.4696	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	1240.2758	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	453.6019	0.1566	71.0202	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	548.0485	0.1411	77.3114	(264)
Space and water heating			148.3316	(265)
Pumps, fans and electric keep-hot	133.1557	0.1387	18.4703	(267)
Energy for lighting	105.4696	0.1443	15.2225	(268)
Total CO2, kg/year			182.0245	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.7900	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	453.6019	1.5796	716.5200	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	548.0485	1.5216	833.9227	(278)
Space and water heating			1550.4427	(279)
Pumps, fans and electric keep-hot	133.1557	1.5128	201.4379	(281)
Energy for lighting	105.4696	1.5338	161.7728	(282)
Total Primary energy kWh/year			1913.6535	(286)
Dwelling Primary energy Rate (DPER)			50.4000	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	37.9700	(1b)	x 2.3600	(2b) =	89.6092	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	37.9700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	89.6092	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.2232	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4732	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.4022	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.5128	0.5028	0.4927	0.4424	0.4324	0.3821	0.3821	0.3720	0.4022	0.4324	0.4525	0.4726	(22b)
Effective ac	0.6315	0.6264	0.6214	0.5979	0.5935	0.5730	0.5730	0.5692	0.5809	0.5935	0.6024	0.6117	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			2.1500	1.0000	2.1500			(26)
TER Opening Type			5.1900	1.1450	5.9427			(27)
GF			37.9700	0.1300	4.9361			(28a)
Main	51.1600	7.3400	43.8200	0.1800	7.8876			(29a)
Total net area of external elements Aum(A, m2)			89.1300					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	20.9164			(33)
Main dwelling								
Party Wall 1			14.8700	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 135.1654 (35)

List of Thermal Bridges

	Length	Psi-value	Total	
K1 Element				
E2 Other lintels (including other steel lintels)	5.7900	0.0500	0.2895	
E3 Sill	5.7900	0.0500	0.2895	
E4 Jamb	12.9000	0.0500	0.6450	
E5 Ground floor (normal)	20.3000	0.1600	3.2480	
E7 Party floor between dwellings (in blocks of flats)	20.3000	0.0700	1.4210	
E16 Corner (normal)	12.6000	0.0900	1.1340	
E17 Corner (inverted - internal area greater than external area)	2.5200	-0.0900	-0.2268	
P1 Party wall - Ground floor	5.9000	0.0800	0.4720	
E18 Party wall between dwellings	2.5200	0.0600	0.1512	
E25 Staggered party wall between dwellings	2.5200	0.0600	0.1512	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.5746 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 28.4910 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	18.6739	18.5229	18.3749	17.6798	17.5497	16.9442	16.9442	16.8321	17.1774	17.5497	17.8128	18.0879	(38)
Heat transfer coeff	47.1649	47.0140	46.8660	46.1708	46.0407	45.4353	45.4353	45.3232	45.6685	46.0407	46.3038	46.5789	(39)
Average = Sum(39)m / 12 =												46.1702	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2422	1.2382	1.2343	1.2160	1.2126	1.1966	1.1966	1.1937	1.2028	1.2126	1.2195	1.2267	(40)
HLP (average)												1.2160	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.3535 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	46.9130	46.2079	45.1806	43.2150	41.7644	40.1467	39.2272	40.2468	41.3644	43.1013	45.1092	46.7332	(42a)
Hot water usage for baths	20.2973	19.9959	19.5714	18.7887	18.2026	17.5528	17.2017	17.6233	18.0822	18.7776	19.5764	20.2287	(42b)
Hot water usage for other uses	28.4911	27.4550	26.4190	25.3830	24.3469	23.3109	23.3109	24.3469	25.3830	26.4190	27.4550	28.4911	(42c)
Average daily hot water use (litres/day)												87.9720	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	95.7014	93.6589	91.1710	87.3866	84.3139	81.0104	79.7399	82.2170	84.8296	88.2979	92.1406	95.4530	(44)
Energy conte	151.5676	133.3690	140.1264	119.6279	113.5028	99.6117	96.4385	101.8018	104.6034	119.8195	131.2712	149.4563	(45)
Energy content (annual)										Total = Sum(45)m =		1461.1961	
Distribution loss (46)m = 0.15 x (45)m	22.7351	20.0053	21.0190	17.9442	17.0254	14.9418	14.4658	15.2703	15.6905	17.9729	19.6907	22.4185	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	198.1625	175.4547	186.7213	164.7198	160.0977	144.7035	143.0334	148.3967	149.6953	166.4144	176.3631	196.0513	(62)
WWHRS	-21.4466	-18.9676	-19.8618	-16.4463	-15.3274	-13.1158	-12.2939	-13.0734	-13.5701	-15.9976	-18.1233	-21.0495	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	176.7158	156.4871	166.8596	148.2735	144.7703	131.5878	130.7394	135.3234	136.1252	150.4168	158.2397	175.0018	(64)
										Total per year (kWh/year) = Sum(64)m =		1810.5403	(64)
12Total per year (kWh/year)												1811	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	87.6721	78.0138	83.8680	75.8498	75.0156	69.1944	69.3417	71.1250	70.8541	77.1159	79.7212	86.9702	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	63.3507	70.1383	63.3507	65.4624	63.3507	65.4624	63.3507	63.3507	65.4624	63.3507	65.4624	63.3507	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	116.4640	117.6725	114.6270	108.1436	99.9594	92.2675	87.1288	85.9203	88.9657	95.4491	103.6333	111.3253	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	(71)
Water heating gains (Table 5)													

	117.8389	116.0919	112.7258	105.3469	100.8274	96.1033	93.2012	95.5981	98.4085	103.6504	110.7238	116.8954	(72)
Total internal gains	343.9559	350.2050	337.0058	325.2552	310.4399	297.1355	286.9830	288.1714	296.1389	308.7526	326.1219	337.8737	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	1.6600	10.6334	0.6300	0.7000	0.7700	5.3945	(74)
South	2.8100	46.7521	0.6300	0.7000	0.7700	40.1494	(78)
West	0.7200	19.6403	0.6300	0.7000	0.7700	4.3217	(80)

Solar gains	49.8656	84.5176	115.1999	143.1098	161.4378	160.9877	154.8950	140.9699	124.7513	93.2255	59.6342	42.7438	(83)
Total gains	393.8215	434.7226	452.2057	468.3650	471.8777	458.1232	441.8780	429.1413	420.8903	401.9781	385.7560	380.6175	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	30.2263	30.3233	30.4191	30.8771	30.9643	31.3769	31.3769	31.4545	31.2167	30.9643	30.7884	30.6065	
alpha	3.0151	3.0216	3.0279	3.0585	3.0643	3.0918	3.0918	3.0970	3.0811	3.0643	3.0526	3.0404	
util living area	0.9341	0.9107	0.8791	0.8155	0.7162	0.5674	0.4302	0.4577	0.6374	0.8155	0.9040	0.9393	(86)
MIT	19.1869	19.4390	19.7792	20.2312	20.6071	20.8650	20.9571	20.9471	20.7955	20.3423	19.7182	19.1564	(87)
Th 2	19.8864	19.8896	19.8927	19.9072	19.9100	19.9227	19.9227	19.9251	19.9178	19.9100	19.9044	19.8987	(88)
util rest of house	0.9230	0.8961	0.8587	0.7835	0.6651	0.4906	0.3334	0.3611	0.5647	0.7776	0.8859	0.9291	(89)
MIT 2	17.8268	18.1410	18.5632	19.1185	19.5515	19.8268	19.9023	19.8982	19.7607	19.2614	18.5037	17.7969	(90)
Living area fraction										fLA = Living area / (4) =		0.4772	(91)
MIT	18.4758	18.7604	19.1435	19.6495	20.0552	20.3222	20.4057	20.3987	20.2545	19.7772	19.0833	18.4457	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.4758	18.7604	19.1435	19.6495	20.0552	20.3222	20.4057	20.3987	20.2545	19.7772	19.0833	18.4457	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9054	0.8781	0.8425	0.7750	0.6724	0.5203	0.3779	0.4049	0.5886	0.7724	0.8697	0.9120	(94)
Useful gains	356.5588	381.7240	380.9846	362.9783	317.3029	238.3496	166.9984	173.7631	247.7437	310.4937	335.4738	347.1228	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	668.6026	651.6334	592.5504	496.3152	384.6815	259.9918	172.9116	181.2354	281.0678	422.5264	554.8722	663.5482	(97)
Space heating kWh	232.1605	181.3791	157.4050	96.0026	50.1297	0.0000	0.0000	0.0000	0.0000	83.3524	157.9669	235.4205	(98a)
Space heating requirement - total per year (kWh/year)												1193.8166	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	232.1605	181.3791	157.4050	96.0026	50.1297	0.0000	0.0000	0.0000	0.0000	83.3524	157.9669	235.4205	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1193.8166	
Space heating per m2											(98c) / (4) =	31.4410	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	232.1605	181.3791	157.4050	96.0026	50.1297	0.0000	0.0000	0.0000	0.0000	83.3524	157.9669	235.4205	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	251.5282	196.5104	170.5362	104.0115	54.3117	0.0000	0.0000	0.0000	0.0000	90.3059	171.1451	255.0601	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	176.7158	156.4871	166.8596	148.2735	144.7703	131.5878	130.7394	135.3234	136.1252	150.4168	158.2397	175.0018	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.6727	84.3917	83.9292	83.1105	81.9359	79.8000	79.8000	79.8000	79.8000	82.7919	84.0559	84.7256	(217)
Fuel for water heating, kWh/month	208.7046	185.4296	198.8100	178.4053	176.6872	164.8970	163.8339	169.5781	170.5829	181.6805	188.2553	206.5513	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	13.1630	10.5599	9.5080	6.9660	5.3807	4.3961	4.9085	6.3802	8.2873	10.8733	12.2814	13.5289	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-18.3785	-26.2319	-38.1925	-43.5580	-47.5578	-44.6790	-44.2052	-41.4865	-36.7116	-30.3542	-20.3486	-15.8581	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)

Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-9.4192	-19.9215	-39.7673	-59.9488	-79.4394	-79.8120	-78.7965	-66.5719	-48.6560	-28.4742	-12.5781	-7.4342 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year	
Space heating fuel - main system 1	1293.4091 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	79.8000
Water heating fuel used	2193.4158 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
Total electricity for the above, kWh/year	86.0000 (231)
Electricity for lighting (calculated in Appendix L)	106.2331 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-938.3812 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	2740.6768 (238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1293.4091	0.2100	271.6159	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2193.4158	0.2100	460.6173	(264)
Space and water heating			732.2332	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	106.2331	0.1443	15.3327	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-407.5620	0.1343	-54.7219	
PV Unit electricity exported	-530.8192	0.1258	-66.7828	
Total			-121.5047	(269)
Total CO2, kg/year			637.9905	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			16.8000	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1293.4091	1.1300	1461.5523	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2193.4158	1.1300	2478.5598	(278)
Space and water heating			3940.1121	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	106.2331	1.5338	162.9439	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-407.5620	1.4962	-609.7976	
PV Unit electricity exported	-530.8192	0.4618	-245.1377	
Total			-854.9353	(283)
Total Primary energy kWh/year			3378.2216	(286)
Target Primary Energy Rate (TPER)			88.9700	(287)

Full SAP Calculation Printout

Property Reference	78449-19	**Issued on Date**	03/10/2025
Assessment Reference	001	**Prop Type Ref**	GF Flat / Mid
Property	12 Shepherd Street, MANCHESTER, M9 4QW		

SAP Rating	86 B	**DER**	4.79	**TER**	16.80
Environmental	97 A	**% DER < TER**			71.49
CO_2 Emissions (t/year)	0.17	**DFEE**	28.20	**TFEE**	40.27
Compliance Check	See BREL	**% DFEE < TFEE**			29.98
% DPER < TPER	43.35	**DPER**	50.40	**TPER**	88.97

Assessor Details	Mr. Daniel Goddard	**Assessor ID**	CP52-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	37.9700	(1b)	x 2.3600	(2b) =	89.6092	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	37.9700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	89.6092	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.2232	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.3500	(17)
Infiltration rate		0.3907	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3321	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4234	0.4151	0.4068	0.3653	0.3570	0.3155	0.3155	0.3072	0.3321	0.3570	0.3736	0.3902	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0.0000	(23c)

Effective ac	0.5896	0.5862	0.5827	0.5667	0.5637	0.5498	0.5498	0.5472	0.5551	0.5637	0.5698	0.5761	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door			2.1500	0.7800	1.6770			(26)
Window			5.1900	0.7282	3.7791			(27)
GF			37.9700	0.0900	3.4173	75.0000	2847.7500	(28a)
Main	51.1600	7.3400	43.8200	0.1300	5.6966	9.0000	394.3800	(29a)
Total net area of external elements Aum(A, m2)			89.1300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		14.5700			(33)
Main dwelling								
Party Wall 1			14.8700	0.0000	0.0000	20.0000	297.4000	(32)
Party Ceiling			37.9700			30.0000	1139.1000	(32b)
Timber			50.4000			9.0000	453.6000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	5132.2300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		135.1654 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	5.7900	0.1150	0.6659
E3 Sill	5.7900	0.0170	0.0984
E4 Jamb	12.9000	0.0940	1.2126

E5 Ground floor (normal)	20.3000	0.0670	1.3601	
E7 Party floor between dwellings (in blocks of flats)	20.3000	0.0320	0.6496	
E16 Corner (normal)	12.6000	0.0680	0.8568	
E17 Corner (inverted - internal area greater than external area)	2.5200	-0.0290	-0.0731	
P1 Party wall - Ground floor	5.9000	0.0560	0.3304	
E18 Party wall between dwellings	2.5200	0.2400	0.6048	
E25 Staggered party wall between dwellings	2.5200	0.0560	0.1411	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.8466 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 20.4166 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.4362	17.3333	17.2324	16.7585	16.6699	16.2571	16.2571	16.1807	16.4161	16.6699	16.8492	17.0367	(38)
Heat transfer coeff	37.8529	37.7499	37.6491	37.1752	37.0865	36.6738	36.6738	36.5973	36.8327	37.0865	37.2659	37.4534	(39)
Average = Sum(39)m / 12 =												37.1747	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9969	0.9942	0.9915	0.9791	0.9767	0.9659	0.9659	0.9638	0.9700	0.9767	0.9815	0.9864	(40)
HLP (average)												0.9791	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.3535 (42)
Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

20.2973	19.9959	19.5714	18.7887	18.2026	17.5528	17.2017	17.6233	18.0822	18.7776	19.5764	20.2287	(42b)

Hot water usage for other uses

28.4911	27.4550	26.4190	25.3830	24.3469	23.3109	23.3109	24.3469	25.3830	26.4190	27.4550	28.4911	(42c)

Average daily hot water use (litres/day) 44.7198 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	48.7884	47.4509	45.9904	44.1717	42.5496	40.8637	40.5126	41.9702	43.4652	45.1966	47.0315	48.7198	(44)
Energy conte	77.2689	67.5695	70.6855	60.4688	57.2799	50.2466	48.9965	51.9679	53.5969	61.3314	67.0049	76.2834	(45)
Energy content (annual)										Total = Sum(45)m =		742.7004	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	65.6786	57.4341	60.0827	51.3985	48.6879	42.7096	41.6470	44.1727	45.5574	52.1317	56.9542	64.8409	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	65.6786	57.4341	60.0827	51.3985	48.6879	42.7096	41.6470	44.1727	45.5574	52.1317	56.9542	64.8409	(64)
									Total per year (kWh/year) = Sum(64)m =			631.2953	(64)
12Total per year (kWh/year)												631	(64)
Electric shower(s)	37.5695	33.4747	36.5531	34.8822	35.5367	33.8986	35.0285	35.5367	34.8822	36.5531	35.8657	37.5695	(64a)
					Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =							427.3504	(64a)
Heat gains from water heating, kWh/month	25.8120	22.7272	24.1589	21.5702	21.0562	19.1521	19.1689	19.9274	20.1099	22.1712	23.2050	25.6026	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	65.2504	72.2415	65.2504	67.4254	65.2504	67.4254	65.2504	65.2504	67.4254	65.2504	67.4254	65.2504	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	116.4640	117.6725	114.6270	108.1436	99.9594	92.2675	87.1288	85.9203	88.9657	95.4491	103.6333	111.3253	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	(71)
Water heating gains (Table 5)	34.6936	33.8202	32.4717	29.9586	28.3013	26.6001	25.7646	26.7841	27.9304	29.8000	32.2292	34.4121	(72)
Total internal gains	259.7102	267.0365	255.6514	248.8299	236.8134	229.5953	221.4461	221.2570	227.6238	233.8018	246.5902	254.2901	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	1.6600	10.6334	0.3800	0.0000	0.7700	5.1648	(74)
South	2.8100	46.7521	0.3800	0.0000	0.7700	38.4398	(78)
West	0.7200	19.6403	0.3800	0.0000	0.7700	4.1377	(80)

Solar gains	47.7423	80.9189	110.2947	137.0162	154.5638	154.1328	148.2996	134.9674	119.4394	89.2559	57.0949	40.9238	(83)
Total gains	307.4525	347.9554	365.9461	385.8461	391.3772	383.7281	369.7457	356.2244	347.0633	323.0578	303.6851	295.2139	(84)

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7. Mean internal temperature (heating season)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	37.6621	37.7648	37.8660	38.3487	38.4404	38.8730	38.8730	38.9542	38.7052	38.4404	38.2554	38.0638	
alpha	3.5108	3.5177	3.5244	3.5566	3.5627	3.5915	3.5915	3.5969	3.5803	3.5627	3.5504	3.5376	
util living area	0.9575	0.9346	0.9037	0.8361	0.7291	0.5663	0.4236	0.4552	0.6477	0.8442	0.9319	0.9623	(86)
MIT	19.4341	19.6890	20.0008	20.4071	20.7222	20.9185	20.9778	20.9710	20.8629	20.4731	19.9055	19.3949	(87)
Th 2	20.0859	20.0882	20.0904	20.1008	20.1028	20.1119	20.1119	20.1136	20.1084	20.1028	20.0988	20.0947	(88)
util rest of house	0.9504	0.9242	0.8880	0.8093	0.6848	0.5005	0.3431	0.3741	0.5848	0.8135	0.9193	0.9560	(89)
MIT 2	18.6704	18.9201	19.2235	19.6154	19.8993	20.0646	20.1029	20.1011	20.0226	19.6847	19.1429	18.6387	(90)
Living area fraction									fLA = Living area / (4) =			0.4772	(91)
MIT	19.0349	19.2870	19.5944	19.9932	20.2920	20.4721	20.5204	20.5163	20.4236	20.0610	19.5068	18.9996	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0349	19.2870	19.5944	19.9932	20.2920	20.4721	20.5204	20.5163	20.4236	20.0610	19.5068	18.9996	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9405	0.9134	0.8782	0.8057	0.6947	0.5279	0.3808	0.4116	0.6080	0.8119	0.9095	0.9466	(94)
Useful gains	289.1587	317.8109	321.3826	310.8904	271.8742	202.5838	140.7835	146.6339	211.0228	262.2841	276.1920	279.4530	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	557.7581	543.1092	492.9930	412.3934	318.6477	215.3519	143.7776	150.6440	232.9160	350.8747	462.3511	554.2948	(97)
Space heating kWh	199.8380	151.4004	127.6781	73.0822	34.7995	0.0000	0.0000	0.0000	0.0000	65.9114	134.0346	204.4823	(98a)
Space heating requirement - total per year (kWh/year)												991.2264	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	199.8380	151.4004	127.6781	73.0822	34.7995	0.0000	0.0000	0.0000	0.0000	65.9114	134.0346	204.4823	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												991.2264	
Space heating per m2											(98c) / (4) =	26.1055	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	344.7334	271.3858	278.1397	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8534	0.9079	0.8937	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	294.1901	246.3850	248.5667	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	421.7214	406.8579	392.3402	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	91.8225	119.3919	106.9675	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	22.9556	29.8480	26.7419	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												79.5455	(107)
Energy for space heating												26.1055	(99)
Energy for space cooling												2.0950	(108)
Total												28.2005	(109)
Fabric Energy Efficiency (DFEE)												28.2	(109)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	37.9700	(1b)	x 2.3600	(2b) =	89.6092	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	37.9700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		89.6092	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	2 * 10 =	20.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.2232 (8)
Pressure test		Yes

Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.4732	(18)
Number of sides sheltered	2	(19)
Shelter factor (20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) =	0.4022	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.5128	0.5028	0.4927	0.4424	0.4324	0.3821	0.3821	0.3720	0.4022	0.4324	0.4525	0.4726	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.6315	0.6264	0.6214	0.5979	0.5935	0.5730	0.5730	0.5692	0.5809	0.5935	0.6024	0.6117	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			2.1500	1.0000	2.1500			(26)
TER Opening Type			5.1900	1.1450	5.9427			(27)
GF			37.9700	0.1300	4.9361			(28a)
Main	51.1600	7.3400	43.8200	0.1800	7.8876			(29a)
Total net area of external elements Aum(A, m2)			89.1300					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	20.9164			(33)
Main dwelling								
Party Wall 1			14.8700	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 135.1654 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	5.7900	0.0500	0.2895
E3 Sill	5.7900	0.0500	0.2895
E4 Jamb	12.9000	0.0500	0.6450
E5 Ground floor (normal)	20.3000	0.1600	3.2480
E7 Party floor between dwellings (in blocks of flats)	20.3000	0.0700	1.4210
E16 Corner (normal)	12.6000	0.0900	1.1340
E17 Corner (inverted - internal area greater than external area)	2.5200	-0.0900	-0.2268
P1 Party wall - Ground floor	5.9000	0.0800	0.4720
E18 Party wall between dwellings	2.5200	0.0600	0.1512
E25 Staggered party wall between dwellings	2.5200	0.0600	0.1512

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	7.5746	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	28.4910	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	18.6739	18.5229	18.3749	17.6798	17.5497	16.9442	16.9442	16.8321	17.1774	17.5497	17.8128	18.0879	(38)
Heat transfer coeff	47.1649	47.0140	46.8660	46.1708	46.0407	45.4353	45.4353	45.3232	45.6685	46.0407	46.3038	46.5789	(39)
Average = Sum(39)m / 12 =												46.1702	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2422	1.2382	1.2343	1.2160	1.2126	1.1966	1.1966	1.1937	1.2028	1.2126	1.2195	1.2267	(40)
HLP (average)												1.2160	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.3535	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	20.2973	19.9959	19.5714	18.7887	18.2026	17.5528	17.2017	17.6233	18.0822	18.7776	19.5764	20.2287	(42b)
Hot water usage for other uses	28.4911	27.4550	26.4190	25.3830	24.3469	23.3109	23.3109	24.3469	25.3830	26.4190	27.4550	28.4911	(42c)
Average daily hot water use (litres/day)												44.7198	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	48.7884	47.4509	45.9904	44.1717	42.5496	40.8637	40.5126	41.9702	43.4652	45.1966	47.0315	48.7198	(44)
Energy conte	77.2689	67.5695	70.6855	60.4688	57.2799	50.2466	48.9965	51.9679	53.5969	61.3314	67.0049	76.2834	(45)
Energy content (annual)										Total = Sum(45)m =		742.7004	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	65.6786	57.4341	60.0827	51.3985	48.6879	42.7096	41.6470	44.1727	45.5574	52.1317	56.9542	64.8409	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	65.6786	57.4341	60.0827	51.3985	48.6879	42.7096	41.6470	44.1727	45.5574	52.1317	56.9542	64.8409	(64)
										Total per year (kWh/year) = Sum(64)m =		631.2953	(64)
12Total per year (kWh/year)												631	(64)
Electric shower(s)	37.5695	33.4747	36.5531	34.8822	35.5367	33.8986	35.0285	35.5367	34.8822	36.5531	35.8657	37.5695	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		427.3504	(64a)
Heat gains from water heating, kWh/month	25.8120	22.7272	24.1589	21.5702	21.0562	19.1521	19.1689	19.9274	20.1099	22.1712	23.2050	25.6026	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	63.3507	70.1383	63.3507	65.4624	63.3507	65.4624	63.3507	63.3507	65.4624	63.3507	65.4624	63.3507	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	116.4640	117.6725	114.6270	108.1436	99.9594	92.2675	87.1288	85.9203	88.9657	95.4491	103.6333	111.3253	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	(71)
Water heating gains (Table 5)													
	34.6936	33.8202	32.4717	29.9586	28.3013	26.6001	25.7646	26.7841	27.9304	29.8000	32.2292	34.4121	(72)
Total internal gains													
	257.8106	264.9333	253.7518	246.8669	234.9138	227.6323	219.5465	219.3574	225.6608	231.9022	244.6272	252.3904	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	1.6600	10.6334	0.6300	0.7000	0.7700	5.3945	(74)
South	2.8100	46.7521	0.6300	0.7000	0.7700	40.1494	(78)
West	0.7200	19.6403	0.6300	0.7000	0.7700	4.3217	(80)

Solar gains	49.8656	84.5176	115.1999	143.1098	161.4378	160.9877	154.8950	140.9699	124.7513	93.2255	59.6342	42.7438	(83)
Total gains	307.6761	349.4510	368.9517	389.9767	396.3516	388.6200	374.4414	360.3272	350.4122	325.1276	304.2613	295.1342	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	30.2263	30.3233	30.4191	30.8771	30.9643	31.3769	31.3769	31.4545	31.2167	30.9643	30.7884	30.6065	
alpha	3.0151	3.0216	3.0279	3.0585	3.0643	3.0918	3.0918	3.0970	3.0811	3.0643	3.0526	3.0404	
util living area													
	0.9633	0.9455	0.9214	0.8690	0.7823	0.6377	0.4952	0.5285	0.7135	0.8763	0.9437	0.9672	(86)
MIT	18.8782	19.1557	19.5300	20.0437	20.4855	20.8120	20.9366	20.9209	20.7158	20.1556	19.4506	18.8439	(87)
Th 2	19.8864	19.8896	19.8927	19.9072	19.9100	19.9227	19.9227	19.9251	19.9178	19.9100	19.9044	19.8987	(88)
util rest of house													
	0.9566	0.9356	0.9065	0.8428	0.7358	0.5590	0.3883	0.4228	0.6428	0.8466	0.9319	0.9612	(89)
MIT 2	17.9826	18.2562	18.6235	19.1262	19.5339	19.8151	19.8984	19.8925	19.7411	19.2420	18.5598	17.9574	(90)
Living area fraction										fLA = Living area / (4) =		0.4772	(91)
MIT	18.4100	18.6855	19.0561	19.5640	19.9880	20.2908	20.3938	20.3833	20.2063	19.6779	18.9849	18.3804	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.4100	18.6855	19.0561	19.5640	19.9880	20.2908	20.3938	20.3833	20.2063	19.6779	18.9849	18.3804	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9450	0.9222	0.8929	0.8334	0.7395	0.5875	0.4368	0.4698	0.6632	0.8392	0.9195	0.9503	(94)
Useful gains	290.7534	322.2763	329.4441	325.0024	293.0868	228.3006	163.5529	169.2771	232.3967	272.8403	279.7552	280.4705	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	665.4969	648.1092	588.4536	492.3676	381.5869	258.5634	172.3729	180.5365	278.8637	417.9552	550.3172	660.5093	(97)
Space heating kWh													
	278.8092	218.9597	192.7030	120.5030	65.8441	0.0000	0.0000	0.0000	0.0000	107.9655	194.8047	282.7489	(98a)
Space heating requirement - total per year (kWh/year)												1462.3380	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	278.8092	218.9597	192.7030	120.5030	65.8441	0.0000	0.0000	0.0000	0.0000	107.9655	194.8047	282.7489	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1462.3380	
Space heating per m2											(98c) / (4) =	38.5130	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	427.0916	336.2211	344.4560	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7578	0.8281	0.8084	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	323.6448	278.4109	278.4730	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	429.5673	414.3872	399.1226	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	76.2642	101.1664	89.7633	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	19.0661	25.2916	22.4408	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												66.7985	(107)
Energy for space heating												38.5130	(99)
Energy for space cooling												1.7592	(108)
Total												40.2722	(109)
Fabric Energy Efficiency (TFEE)												40.3	(109)

Full SAP Calculation Printout

Property Reference	78449-19	**Issued on Date**	03/10/2025
Assessment Reference	001	**Prop Type Ref**	GF Flat / Mid
Property	12 Shepherd Street, MANCHESTER, M9 4QW		

SAP Rating	86 B	**DER**	4.79	**TER**	16.80
Environmental	97 A	**% DER < TER**			71.49
CO_2 Emissions (t/year)	0.17	**DFEE**	28.20	**TFEE**	40.27
Compliance Check	See BREL	**% DFEE < TFEE**			29.98
% DPER < TPER	43.35	**DPER**	50.40	**TPER**	88.97

Assessor Details	Mr. Daniel Goddard	**Assessor ID**	CP52-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	37.9700	(1b)	x 2.3600	(2b) =	89.6092	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	37.9700					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	89.6092	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.3500	(17)
Infiltration rate		0.1675	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1424	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1815	0.1780	0.1744	0.1566	0.1531	0.1353	0.1353	0.1317	0.1424	0.1531	0.1602	0.1673	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	80.1000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2810	0.2775	0.2739	0.2561	0.2526	0.2348	0.2348	0.2312	0.2419	0.2526	0.2597	0.2668	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door			2.1500	0.7800	1.6770			(26)
Window			5.1900	0.7282	3.7791			(27)
GF			37.9700	0.0900	3.4173	75.0000	2847.7500	(28a)
Main	51.1600	7.3400	43.8200	0.1300	5.6966	9.0000	394.3800	(29a)
Total net area of external elements Aum(A, m2)			89.1300					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	14.5700			(33)
Main dwelling								
Party Wall 1			14.8700	0.0000	0.0000	20.0000	297.4000	(32)
Party Ceiling			37.9700			20.0000	759.4000	(32b)
Timber			50.4000			9.0000	453.6000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 4752.5300	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	125.1654	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total

E2 Other lintels (including other steel lintels)	5.7900	0.1150	0.6659	
E3 Sill	5.7900	0.0170	0.0984	
E4 Jamb	12.9000	0.0940	1.2126	
E5 Ground floor (normal)	20.3000	0.0670	1.3601	
E7 Party floor between dwellings (in blocks of flats)	20.3000	0.0320	0.6496	
E16 Corner (normal)	12.6000	0.0680	0.8568	
E17 Corner (inverted - internal area greater than external area)	2.5200	-0.0290	-0.0731	
P1 Party wall - Ground floor	5.9000	0.0560	0.3304	
E18 Party wall between dwellings	2.5200	0.2400	0.6048	
E25 Staggered party wall between dwellings	2.5200	0.0560	0.1411	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.8466 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 20.4166 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	8.3103	8.2050	8.0998	7.5735	7.4683	6.9420	6.9420	6.8367	7.1525	7.4683	7.6788	7.8893	(38)
Heat transfer coeff	28.7269	28.6217	28.5164	27.9902	27.8849	27.3586	27.3586	27.2534	27.5691	27.8849	28.0954	28.3059	(39)
Average = Sum(39)m / 12 =												27.9638	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7566	0.7538	0.7510	0.7372	0.7344	0.7205	0.7205	0.7178	0.7261	0.7344	0.7399	0.7455	(40)
HLP (average)												0.7365	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.3535 (42)

Hot water usage for mixer showers

46.9130	46.2079	45.1806	43.2150	41.7644	40.1467	39.2272	40.2468	41.3644	43.1013	45.1092	46.7332	(42a)

Hot water usage for baths

20.2973	19.9959	19.5714	18.7887	18.2026	17.5528	17.2017	17.6233	18.0822	18.7776	19.5764	20.2287	(42b)

Hot water usage for other uses

28.4911	27.4550	26.4190	25.3830	24.3469	23.3109	23.3109	24.3469	25.3830	26.4190	27.4550	28.4911	(42c)

Average daily hot water use (litres/day) 87.9720 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	95.7014	93.6589	91.1710	87.3866	84.3139	81.0104	79.7399	82.2170	84.8296	88.2979	92.1406	95.4530	(44)
Energy conte	151.5676	133.3690	140.1264	119.6279	113.5028	99.6117	96.4385	101.8018	104.6034	119.8195	131.2712	149.4563	(45)
Energy content (annual)											Total = Sum(45)m =	1461.1961	
Distribution loss (46)m = 0.15 x (45)m	22.7351	20.0053	21.0190	17.9442	17.0254	14.9418	14.4658	15.2703	15.6905	17.9729	19.6907	22.4185	(46)

Water storage loss:
Store volume 200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.6100 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.8694 (55)
Total storage loss

26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)

If cylinder contains dedicated solar storage

26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

178.5190	157.7122	167.0778	145.7099	140.4542	125.6937	123.3899	128.7532	130.6854	146.7709	157.3532	176.4077	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

178.5190	157.7122	167.0778	145.7099	140.4542	125.6937	123.3899	128.7532	130.6854	146.7709	157.3532	176.4077	(64)
									Total per year (kWh/year) = Sum(64)m =		1778.5271	(64)
12Total per year (kWh/year)											1779	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)

Heat gains from water heating, kWh/month

50.3962	44.3452	46.5920	39.7763	37.7397	33.1209	32.0658	33.8491	34.7806	39.8400	43.6477	49.6942	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	65.2504	72.2415	65.2504	67.4254	65.2504	67.4254	65.2504	65.2504	67.4254	65.2504	67.4254	65.2504	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	116.4640	117.6725	114.6270	108.1436	99.9594	92.2675	87.1288	85.9203	88.9657	95.4491	103.6333	111.3253	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		(70)
Losses e.g. evaporation (negative values) (Table 5)	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	(71)
Water heating gains (Table 5)	67.7369	65.9899	62.6237	55.2449	50.7254	46.0012	43.0992	45.4961	48.3064	53.5483	60.6218	66.7933	(72)
Total internal gains	292.7535	299.2062	285.8035	274.1162	259.2375	248.9965	238.7807	239.9691	247.9999	257.5502	274.9828	286.6713	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	1.6600	10.6334	0.3800	0.0000	0.7700	5.1648	(74)
South	2.8100	46.7521	0.3800	0.0000	0.7700	38.4398	(78)
West	0.7200	19.6403	0.3800	0.0000	0.7700	4.1377	(80)

Solar gains	47.7423	80.9189	110.2947	137.0162	154.5638	154.1328	148.2996	134.9674	119.4394	89.2559	57.0949	40.9238	(83)
Total gains	340.4958	380.1251	396.0981	411.1324	413.8013	403.1293	387.0802	374.9364	367.4393	346.8061	332.0777	327.5951	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	45.9550	46.1240	46.2943	47.1647	47.3427	48.2534	48.2534	48.4398	47.8850	47.3427	46.9880	46.6386	
alpha	4.0637	4.0749	4.0863	4.1443	4.1562	4.2169	4.2169	4.2293	4.1923	4.1562	4.1325	4.1092	
util living area	0.9125	0.8718	0.8203	0.7208	0.5898	0.4269	0.3094	0.3322	0.5014	0.7281	0.8644	0.9210	(86)
MIT	20.1057	20.3147	20.5304	20.7744	20.9187	20.9840	20.9968	20.9956	20.9679	20.8001	20.4494	20.0767	(87)
Th 2	20.2911	20.2936	20.2960	20.3081	20.3106	20.3227	20.3227	20.3252	20.3179	20.3106	20.3057	20.3008	(88)
util rest of house	0.9018	0.8574	0.8006	0.6930	0.5533	0.3839	0.2624	0.2843	0.4561	0.6959	0.8471	0.9111	(89)
MIT 2	19.2570	19.5142	19.7771	20.0731	20.2342	20.3104	20.3209	20.3226	20.2917	20.1091	19.6930	19.2291	(90)
Living area fraction										fLA = Living area / (4) =		0.4772	(91)
MIT	19.6620	19.8962	20.1366	20.4078	20.5608	20.6319	20.6434	20.6438	20.6144	20.4389	20.0540	19.6336	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6620	19.8962	20.1366	20.4078	20.5608	20.6319	20.6434	20.6438	20.6144	20.4389	20.0540	19.6336	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8911	0.8485	0.7959	0.6972	0.5668	0.4037	0.2847	0.3070	0.4760	0.7021	0.8402	0.9005	(94)
Useful gains	303.4057	322.5237	315.2637	286.6253	234.5288	162.7478	110.2203	115.1027	174.9161	243.4972	279.0101	294.9977	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	441.3039	429.2165	388.8677	322.1047	247.0832	165.0244	110.6226	115.6568	179.5962	274.3564	363.9472	436.8622	(97)
Space heating kWh	102.5963	71.6976	54.7614	25.5451	9.3404	0.0000	0.0000	0.0000	0.0000	22.9592	61.1547	105.5472	(98a)
Space heating requirement - total per year (kWh/year)												453.6019	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	102.5963	71.6976	54.7614	25.5451	9.3404	0.0000	0.0000	0.0000	0.0000	22.9592	61.1547	105.5472	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												453.6019	
Space heating per m2											(98c) / (4) =	11.9463	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	102.5963	71.6976	54.7614	25.5451	9.3404	0.0000	0.0000	0.0000	0.0000	22.9592	61.1547	105.5472	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	102.5963	71.6976	54.7614	25.5451	9.3404	0.0000	0.0000	0.0000	0.0000	22.9592	61.1547	105.5472	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	178.5190	157.7122	167.0778	145.7099	140.4542	125.6937	123.3899	128.7532	130.6854	146.7709	157.3532	176.4077	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month	55.0102	48.5986	51.4846	44.9001	43.2806	38.7322	38.0223	39.6750	40.2704	45.2271	48.4880	54.3596	(219)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	11.3091	10.2147	11.3091	10.9443	11.3091	10.9443	11.3091	11.3091	10.9443	11.3091	10.9443	11.3091	(231)
Lighting	13.0684	10.4840	9.4397	6.9159	5.3420	4.3645	4.8732	6.3343	8.2277	10.7952	12.1931	13.4316	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												453.6019	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												324.5200	
Water heating fuel used												548.0485	(219)
Space cooling fuel												0.0000	(221)

Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.2180)		
mechanical ventilation fans (SFP = 1.2180)	133.1557	(230a)
Total electricity for the above, kWh/year	133.1557	(231)
Electricity for lighting (calculated in Appendix L)	105.4696	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	1240.2758	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	453.6019	0.1566	71.0202	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	548.0485	0.1411	77.3114	(264)
Space and water heating			148.3316	(265)
Pumps, fans and electric keep-hot	133.1557	0.1387	18.4703	(267)
Energy for lighting	105.4696	0.1443	15.2225	(268)
Total CO2, kg/year			182.0245	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.7900	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	453.6019	1.5796	716.5200	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	548.0485	1.5216	833.9227	(278)
Space and water heating			1550.4427	(279)
Pumps, fans and electric keep-hot	133.1557	1.5128	201.4379	(281)
Energy for lighting	105.4696	1.5338	161.7728	(282)
Total Primary energy kWh/year			1913.6535	(286)
Dwelling Primary energy Rate (DPER)			50.4000	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	37.9700	(1b)	x 2.3600	(2b) =	89.6092	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	37.9700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	89.6092	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.2232	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4732	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.4022	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.5128	0.5028	0.4927	0.4424	0.4324	0.3821	0.3821	0.3720	0.4022	0.4324	0.4525	0.4726	(22b)
Effective ac	0.6315	0.6264	0.6214	0.5979	0.5935	0.5730	0.5730	0.5692	0.5809	0.5935	0.6024	0.6117	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			2.1500	1.0000	2.1500			(26)
TER Opening Type			5.1900	1.1450	5.9427			(27)
GF			37.9700	0.1300	4.9361			(28a)
Main	51.1600	7.3400	43.8200	0.1800	7.8876			(29a)
Total net area of external elements Aum(A, m2)			89.1300					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	20.9164			(33)
Main dwelling								
Party Wall 1			14.8700	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 135.1654 (35)

List of Thermal Bridges

	Length	Psi-value	Total	
K1 Element				
E2 Other lintels (including other steel lintels)	5.7900	0.0500	0.2895	
E3 Sill	5.7900	0.0500	0.2895	
E4 Jamb	12.9000	0.0500	0.6450	
E5 Ground floor (normal)	20.3000	0.1600	3.2480	
E7 Party floor between dwellings (in blocks of flats)	20.3000	0.0700	1.4210	
E16 Corner (normal)	12.6000	0.0900	1.1340	
E17 Corner (inverted - internal area greater than external area)	2.5200	-0.0900	-0.2268	
P1 Party wall - Ground floor	5.9000	0.0800	0.4720	
E18 Party wall between dwellings	2.5200	0.0600	0.1512	
E25 Staggered party wall between dwellings	2.5200	0.0600	0.1512	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.5746 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 28.4910 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	18.6739	18.5229	18.3749	17.6798	17.5497	16.9442	16.9442	16.8321	17.1774	17.5497	17.8128	18.0879	(38)
Heat transfer coeff	47.1649	47.0140	46.8660	46.1708	46.0407	45.4353	45.4353	45.3232	45.6685	46.0407	46.3038	46.5789	(39)
Average = Sum(39)m / 12 =												46.1702	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2422	1.2382	1.2343	1.2160	1.2126	1.1966	1.1966	1.1937	1.2028	1.2126	1.2195	1.2267	(40)
HLP (average)												1.2160	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.3535 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	46.9130	46.2079	45.1806	43.2150	41.7644	40.1467	39.2272	40.2468	41.3644	43.1013	45.1092	46.7332	(42a)
Hot water usage for baths	20.2973	19.9959	19.5714	18.7887	18.2026	17.5528	17.2017	17.6233	18.0822	18.7776	19.5764	20.2287	(42b)
Hot water usage for other uses	28.4911	27.4550	26.4190	25.3830	24.3469	23.3109	23.3109	24.3469	25.3830	26.4190	27.4550	28.4911	(42c)
Average daily hot water use (litres/day)												87.9720	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	95.7014	93.6589	91.1710	87.3866	84.3139	81.0104	79.7399	82.2170	84.8296	88.2979	92.1406	95.4530	(44)
Energy conte	151.5676	133.3690	140.1264	119.6279	113.5028	99.6117	96.4385	101.8018	104.6034	119.8195	131.2712	149.4563	(45)
Energy content (annual)										Total = Sum(45)m =		1461.1961	
Distribution loss (46)m = 0.15 x (45)m	22.7351	20.0053	21.0190	17.9442	17.0254	14.9418	14.4658	15.2703	15.6905	17.9729	19.6907	22.4185	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	198.1625	175.4547	186.7213	164.7198	160.0977	144.7035	143.0334	148.3967	149.6953	166.4144	176.3631	196.0513	(62)
WWHRS	-21.4466	-18.9676	-19.8618	-16.4463	-15.3274	-13.1158	-12.2939	-13.0734	-13.5701	-15.9976	-18.1233	-21.0495	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	176.7158	156.4871	166.8596	148.2735	144.7703	131.5878	130.7394	135.3234	136.1252	150.4168	158.2397	175.0018	(64)
										Total per year (kWh/year) = Sum(64)m =		1810.5403	(64)
12Total per year (kWh/year)												1811	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	87.6721	78.0138	83.8680	75.8498	75.0156	69.1944	69.3417	71.1250	70.8541	77.1159	79.7212	86.9702	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	63.3507	70.1383	63.3507	65.4624	63.3507	65.4624	63.3507	63.3507	65.4624	63.3507	65.4624	63.3507	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	116.4640	117.6725	114.6270	108.1436	99.9594	92.2675	87.1288	85.9203	88.9657	95.4491	103.6333	111.3253	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	(71)
Water heating gains (Table 5)													

	117.8389	116.0919	112.7258	105.3469	100.8274	96.1033	93.2012	95.5981	98.4085	103.6504	110.7238	116.8954	(72)
Total internal gains	343.9559	350.2050	337.0058	325.2552	310.4399	297.1355	286.9830	288.1714	296.1389	308.7526	326.1219	337.8737	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	1.6600	10.6334	0.6300	0.7000	0.7700	5.3945	(74)
South	2.8100	46.7521	0.6300	0.7000	0.7700	40.1494	(78)
West	0.7200	19.6403	0.6300	0.7000	0.7700	4.3217	(80)

Solar gains	49.8656	84.5176	115.1999	143.1098	161.4378	160.9877	154.8950	140.9699	124.7513	93.2255	59.6342	42.7438	(83)
Total gains	393.8215	434.7226	452.2057	468.3650	471.8777	458.1232	441.8780	429.1413	420.8903	401.9781	385.7560	380.6175	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	30.2263	30.3233	30.4191	30.8771	30.9643	31.3769	31.3769	31.4545	31.2167	30.9643	30.7884	30.6065	
alpha	3.0151	3.0216	3.0279	3.0585	3.0643	3.0918	3.0918	3.0970	3.0811	3.0643	3.0526	3.0404	
util living area	0.9341	0.9107	0.8791	0.8155	0.7162	0.5674	0.4302	0.4577	0.6374	0.8155	0.9040	0.9393	(86)
MIT	19.1869	19.4390	19.7792	20.2312	20.6071	20.8650	20.9571	20.9471	20.7955	20.3423	19.7182	19.1564	(87)
Th 2	19.8864	19.8896	19.8927	19.9072	19.9100	19.9227	19.9227	19.9251	19.9178	19.9100	19.9044	19.8987	(88)
util rest of house	0.9230	0.8961	0.8587	0.7835	0.6651	0.4906	0.3334	0.3611	0.5647	0.7776	0.8859	0.9291	(89)
MIT 2	17.8268	18.1410	18.5632	19.1185	19.5515	19.8268	19.9023	19.8982	19.7607	19.2614	18.5037	17.7969	(90)
Living area fraction										fLA = Living area / (4) =		0.4772	(91)
MIT	18.4758	18.7604	19.1435	19.6495	20.0552	20.3222	20.4057	20.3987	20.2545	19.7772	19.0833	18.4457	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.4758	18.7604	19.1435	19.6495	20.0552	20.3222	20.4057	20.3987	20.2545	19.7772	19.0833	18.4457	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9054	0.8781	0.8425	0.7750	0.6724	0.5203	0.3779	0.4049	0.5886	0.7724	0.8697	0.9120	(94)
Useful gains	356.5588	381.7240	380.9846	362.9783	317.3029	238.3496	166.9984	173.7631	247.7437	310.4937	335.4738	347.1228	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	668.6026	651.6334	592.5504	496.3152	384.6815	259.9918	172.9116	181.2354	281.0678	422.5264	554.8722	663.5482	(97)
Space heating kWh	232.1605	181.3791	157.4050	96.0026	50.1297	0.0000	0.0000	0.0000	0.0000	83.3524	157.9669	235.4205	(98a)
Space heating requirement - total per year (kWh/year)												1193.8166	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	232.1605	181.3791	157.4050	96.0026	50.1297	0.0000	0.0000	0.0000	0.0000	83.3524	157.9669	235.4205	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1193.8166	
Space heating per m2											(98c) / (4) =	31.4410	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	232.1605	181.3791	157.4050	96.0026	50.1297	0.0000	0.0000	0.0000	0.0000	83.3524	157.9669	235.4205	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	251.5282	196.5104	170.5362	104.0115	54.3117	0.0000	0.0000	0.0000	0.0000	90.3059	171.1451	255.0601	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	176.7158	156.4871	166.8596	148.2735	144.7703	131.5878	130.7394	135.3234	136.1252	150.4168	158.2397	175.0018	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.6727	84.3917	83.9292	83.1105	81.9359	79.8000	79.8000	79.8000	79.8000	82.7919	84.0559	84.7256	(217)
Fuel for water heating, kWh/month	208.7046	185.4296	198.8100	178.4053	176.6872	164.8970	163.8339	169.5781	170.5829	181.6805	188.2553	206.5513	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	13.1630	10.5599	9.5080	6.9660	5.3807	4.3961	4.9085	6.3802	8.2873	10.8733	12.2814	13.5289	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-18.3785	-26.2319	-38.1925	-43.5580	-47.5578	-44.6790	-44.2052	-41.4865	-36.7116	-30.3542	-20.3486	-15.8581	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)

Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-9.4192	-19.9215	-39.7673	-59.9488	-79.4394	-79.8120	-78.7965	-66.5719	-48.6560	-28.4742	-12.5781	-7.4342 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year	
Space heating fuel - main system 1	1293.4091 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	79.8000
Water heating fuel used	2193.4158 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
Total electricity for the above, kWh/year	86.0000 (231)
Electricity for lighting (calculated in Appendix L)	106.2331 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-938.3812 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	2740.6768 (238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1293.4091	0.2100	271.6159	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2193.4158	0.2100	460.6173	(264)
Space and water heating			732.2332	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	106.2331	0.1443	15.3327	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-407.5620	0.1343	-54.7219	
PV Unit electricity exported	-530.8192	0.1258	-66.7828	
Total			-121.5047	(269)
Total CO2, kg/year			637.9905	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			16.8000	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1293.4091	1.1300	1461.5523	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2193.4158	1.1300	2478.5598	(278)
Space and water heating			3940.1121	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	106.2331	1.5338	162.9439	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-407.5620	1.4962	-609.7976	
PV Unit electricity exported	-530.8192	0.4618	-245.1377	
Total			-854.9353	(283)
Total Primary energy kWh/year			3378.2216	(286)
Target Primary Energy Rate (TPER)			88.9700	(287)

Full SAP Calculation Printout

Property Reference	78449-19	**Issued on Date**	03/10/2025
Assessment Reference	001	**Prop Type Ref**	GF Flat / Mid
Property	12 Shepherd Street, MANCHESTER, M9 4QW		

SAP Rating	86 B	**DER**	4.79	**TER**	16.80
Environmental	97 A	**% DER < TER**			71.49
CO_2 Emissions (t/year)	0.17	**DFEE**	28.20	**TFEE**	40.27
Compliance Check	See BREL	**% DFEE < TFEE**			29.98
% DPER < TPER	43.35	**DPER**	50.40	**TPER**	88.97

Assessor Details	Mr. Daniel Goddard	**Assessor ID**	CP52-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	37.9700 (1b)	x	2.3600 (2b)	=	89.6092	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	37.9700					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	89.6092	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.3500	(17)
Infiltration rate		0.1675	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1424	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1815	0.1780	0.1744	0.1566	0.1531	0.1353	0.1353	0.1317	0.1424	0.1531	0.1602	0.1673	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =		80.1000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2810	0.2775	0.2739	0.2561	0.2526	0.2348	0.2348	0.2312	0.2419	0.2526	0.2597	0.2668	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door			2.1500	0.7800	1.6770			(26)
Window			5.1900	0.7282	3.7791			(27)
GF			37.9700	0.0900	3.4173	75.0000	2847.7500	(28a)
Main	51.1600	7.3400	43.8200	0.1300	5.6966	9.0000	394.3800	(29a)
Total net area of external elements Aum(A, m2)			89.1300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		14.5700			(33)
Main dwelling								
Party Wall 1			14.8700	0.0000	0.0000	20.0000	297.4000	(32)
Party Ceiling			37.9700			30.0000	1139.1000	(32b)
Timber			50.4000			9.0000	453.6000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	5132.2300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		135.1654 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total

E2 Other lintels (including other steel lintels)	5.7900	0.1150	0.6659	
E3 Sill	5.7900	0.0170	0.0984	
E4 Jamb	12.9000	0.0940	1.2126	
E5 Ground floor (normal)	20.3000	0.0670	1.3601	
E7 Party floor between dwellings (in blocks of flats)	20.3000	0.0320	0.6496	
E16 Corner (normal)	12.6000	0.0680	0.8568	
E17 Corner (inverted - internal area greater than external area)	2.5200	-0.0290	-0.0731	
P1 Party wall - Ground floor	5.9000	0.0560	0.3304	
E18 Party wall between dwellings	2.5200	0.2400	0.6048	
E25 Staggered party wall between dwellings	2.5200	0.0560	0.1411	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				5.8466 (36)
Point Thermal bridges			(36a) =	0.0000
Total fabric heat loss			(33) + (36) + (36a) =	20.4166 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	8.3103	8.2050	8.0998	7.5735	7.4683	6.9420	6.9420	6.8367	7.1525	7.4683	7.6788	7.8893	(38)
Heat transfer coeff	28.7269	28.6217	28.5164	27.9902	27.8849	27.3586	27.3586	27.2534	27.5691	27.8849	28.0954	28.3059	(39)
Average = Sum(39)m / 12 =												27.9638	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7566	0.7538	0.7510	0.7372	0.7344	0.7205	0.7205	0.7178	0.7261	0.7344	0.7399	0.7455	(40)
HLP (average)												0.7365	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.3535	(42)
Hot water usage for mixer showers	46.9130	46.2079	45.1806	43.2150	41.7644	40.1467	39.2272	40.2468	41.3644	43.1013	45.1092	46.7332	(42a)
Hot water usage for baths	20.2973	19.9959	19.5714	18.7887	18.2026	17.5528	17.2017	17.6233	18.0822	18.7776	19.5764	20.2287	(42b)
Hot water usage for other uses	28.4911	27.4550	26.4190	25.3830	24.3469	23.3109	23.3109	24.3469	25.3830	26.4190	27.4550	28.4911	(42c)
Average daily hot water use (litres/day)												87.9720	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	95.7014	93.6589	91.1710	87.3866	84.3139	81.0104	79.7399	82.2170	84.8296	88.2979	92.1406	95.4530	(44)
Energy conte	151.5676	133.3690	140.1264	119.6279	113.5028	99.6117	96.4385	101.8018	104.6034	119.8195	131.2712	149.4563	(45)
Energy content (annual)											Total = Sum(45)m =	1461.1961	
Distribution loss (46)m = 0.15 x (45)m	22.7351	20.0053	21.0190	17.9442	17.0254	14.9418	14.4658	15.2703	15.6905	17.9729	19.6907	22.4185	(46)
Water storage loss:													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8694	(55)
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	178.5190	157.7122	167.0778	145.7099	140.4542	125.6937	123.3899	128.7532	130.6854	146.7709	157.3532	176.4077	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	178.5190	157.7122	167.0778	145.7099	140.4542	125.6937	123.3899	128.7532	130.6854	146.7709	157.3532	176.4077	(64)
										Total per year (kWh/year) = Sum(64)m =		1778.5271	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	50.3962	44.3452	46.5920	39.7763	37.7397	33.1209	32.0658	33.8491	34.7806	39.8400	43.6477	49.6942	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	81.2094	81.2094	81.2094	81.2094	81.2094	81.2094	81.2094	81.2094	81.2094	81.2094	81.2094	81.2094	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	14.9303	13.2610	10.7845	8.1646	6.1031	5.1525	5.5675	7.2368	9.7132	12.3332	14.3947	15.3453	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	173.8268	175.6306	171.0851	161.4084	149.1932	137.7127	130.0430	128.2392	132.7847	142.4614	154.6766	166.1571	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	44.4744	44.4744	44.4744	44.4744	44.4744	44.4744	44.4744	44.4744	44.4744	44.4744	44.4744	44.4744	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	(71)
Water heating gains (Table 5)	67.7369	65.9899	62.6237	55.2449	50.7254	46.0012	43.0992	45.4961	48.3064	53.5483	60.6218	66.7933	(72)
Total internal gains	328.0382	326.4256	316.0376	296.3620	277.5659	260.4106	250.2538	252.5163	262.3486	279.8872	301.2372	319.8399	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	1.6600	10.6334	0.3800	0.0000	0.7700	5.1648	(74)
South	2.8100	46.7521	0.3800	0.0000	0.7700	38.4398	(78)
West	0.7200	19.6403	0.3800	0.0000	0.7700	4.1377	(80)

Solar gains	47.7423	80.9189	110.2947	137.0162	154.5638	154.1328	148.2996	134.9674	119.4394	89.2559	57.0949	40.9238	(83)

Total gains	375.7805	407.3445	426.3323	433.3782	432.1297	414.5435	398.5534	387.4837	381.7880	369.1431	358.3322	360.7637	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	49.6266	49.8091	49.9929	50.9329	51.1251	52.1086	52.1086	52.3098	51.7107	51.1251	50.7421	50.3647	
alpha	4.3084	4.3206	4.3329	4.3955	4.4083	4.4739	4.4739	4.4873	4.4474	4.4083	4.3828	4.3576	
util living area													
	0.8959	0.8585	0.7998	0.7029	0.5731	0.4172	0.3010	0.3222	0.4867	0.7058	0.8475	0.9062	(86)
MIT	20.2853	20.4445	20.6373	20.8289	20.9414	20.9891	20.9980	20.9973	20.9778	20.8519	20.5638	20.2551	(87)
Th 2	20.2911	20.2936	20.2960	20.3081	20.3106	20.3227	20.3227	20.3252	20.3179	20.3106	20.3057	20.3008	(88)
util rest of house													
	0.8832	0.8425	0.7785	0.6741	0.5363	0.3747	0.2551	0.2755	0.4419	0.6722	0.8281	0.8946	(89)
MIT 2	19.4740	19.6686	19.9009	20.1328	20.2567	20.3146	20.3216	20.3236	20.3003	20.1644	19.8270	19.4453	(90)
Living area fraction										fLA = Living area / (4) =		0.4772	(91)
MIT	19.8612	20.0389	20.2523	20.4650	20.5834	20.6365	20.6444	20.6451	20.6236	20.4925	20.1786	19.8317	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8612	20.0389	20.2523	20.4650	20.5834	20.6365	20.6444	20.6451	20.6236	20.4925	20.1786	19.8317	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8747	0.8362	0.7771	0.6808	0.5511	0.3945	0.2770	0.2977	0.4622	0.6813	0.8243	0.8859	(94)
Useful gains	328.7012	340.6388	331.2891	295.0507	238.1466	163.5210	110.3904	115.3350	176.4482	251.5146	295.3751	319.6118	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	447.0243	433.2999	392.1672	323.7063	247.7132	165.1496	110.6494	115.6933	179.8496	275.8502	367.4498	442.4700	(97)
Space heating kWh													
	88.0324	62.2683	45.2933	20.6320	7.1175	0.0000	0.0000	0.0000	0.0000	18.1056	51.8938	91.4065	(98a)
Space heating requirement - total per year (kWh/year)												384.7494	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	88.0324	62.2683	45.2933	20.6320	7.1175	0.0000	0.0000	0.0000	0.0000	18.1056	51.8938	91.4065	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												384.7494	
Space heating per m2											(98c) / (4) =	10.1330	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Fraction of main heating from main system 2												0.0000	(203)
Fraction of total heating from main system 1												1.0000	(204)
Fraction of total heating from main system 2												0.0000	(205)
Efficiency of main space heating system 1 (in %)												100.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	88.0324	62.2683	45.2933	20.6320	7.1175	0.0000	0.0000	0.0000	0.0000	18.1056	51.8938	91.4065	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000		(210)
Space heating fuel (main heating system)													
	88.0324	62.2683	45.2933	20.6320	7.1175	0.0000	0.0000	0.0000	0.0000	18.1056	51.8938	91.4065	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement													
	178.5190	157.7122	167.0778	145.7099	140.4542	125.6937	123.3899	128.7532	130.6854	146.7709	157.3532	176.4077	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month													
	55.0102	48.5986	51.4846	44.9001	43.2806	38.7322	38.0223	39.6750	40.2704	45.2271	48.4880	54.3596	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	11.3091	10.2147	11.3091	10.9443	11.3091	10.9443	11.3091	11.3091	10.9443	11.3091	10.9443	11.3091	(231)
Lighting	13.0684	10.4840	9.4397	6.9159	5.3420	4.3645	4.8732	6.3343	8.2277	10.7952	12.1931	13.4316	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												384.7494	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												324.5200	
Water heating fuel used												548.0485	(219)
Space cooling fuel												0.0000	(221)

Electricity for pumps and fans:
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.2180)
mechanical ventilation fans (SFP = 1.2180) 133.1557 (230a)
Total electricity for the above, kWh/year 133.1557 (231)
Electricity for lighting (calculated in Appendix L) 105.4696 (232)

Energy saving/generation technologies (Appendices M ,N and Q)
PV generation 0.0000 (233)
Wind generation 0.0000 (234)
Hydro-electric generation (Appendix N) 0.0000 (235a)
Electricity generated - Micro CHP (Appendix N) 0.0000 (235)
Appendix Q - special features
Energy saved or generated -0.0000 (236)
Energy used 0.0000 (237)
Total delivered energy for all uses 1171.4233 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	384.7494	16.4900	63.4452	(240)
Space heating - main system 2	0.0000	16.4900	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	548.0485	16.4900	90.3732	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	133.1557	16.4900	21.9574	(249)
Energy for lighting	105.4696	16.4900	17.3919	(250)
Additional standing charges			0.0000	(251)
Total energy cost			193.1677	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12): 0.3600 (256)
Energy cost factor (ECF) [(255) x (256)] / [(4) + 45.0] = 0.8381 (257)
SAP value 86.4138
SAP rating (Section 12) 86 (258)
SAP band B

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	384.7494	0.1568	60.3296	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	548.0485	0.1411	77.3114	(264)
Space and water heating			137.6410	(265)
Pumps, fans and electric keep-hot	133.1557	0.1387	18.4703	(267)
Energy for lighting	105.4696	0.1443	15.2225	(268)
Total CO2, kg/year			171.3339	(272)
CO2 emissions per m2			4.5100	(273)
EI value			97.2329	
EI rating			97	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	37.9700	(1b) x	2.3600	(2b) =	89.6092	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	37.9700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		89.6092	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.3500	(17)
Infiltration rate		0.1675	(18)

Number of sides sheltered 2 (19)

Shelter factor (20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.1424 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.6000	4.5000	4.5000	4.1000	4.2000	3.7000	3.5000	3.5000	3.7000	4.1000	4.1000	4.2000	(22)
Wind factor	1.1500	1.1250	1.1250	1.0250	1.0500	0.9250	0.8750	0.8750	0.9250	1.0250	1.0250	1.0500	(22a)
Adj infilt rate	0.1637	0.1602	0.1602	0.1459	0.1495	0.1317	0.1246	0.1246	0.1317	0.1459	0.1459	0.1495	(22b)

Balanced mechanical ventilation with heat recovery
If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 80.1000 (23c)

Effective ac	0.2632	0.2597	0.2597	0.2454	0.2490	0.2312	0.2241	0.2241	0.2312	0.2454	0.2454	0.2490	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door			2.1500	0.7800	1.6770			(26)
Window			5.1900	0.7282	3.7791			(27)
GF			37.9700	0.0900	3.4173	75.0000	2847.7500	(28a)
Main	51.1600	7.3400	43.8200	0.1300	5.6966	9.0000	394.3800	(29a)
Total net area of external elements Aum(A, m2)			89.1300					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	14.5700			(33)
Main dwelling								
Party Wall 1			14.8700	0.0000	0.0000	20.0000	297.4000	(32)
Party Ceiling			37.9700			30.0000	1139.1000	(32b)
Timber			50.4000			9.0000	453.6000	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 5132.2300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 135.1654 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	5.7900	0.1150	0.6659
E3 Sill	5.7900	0.0170	0.0984
E4 Jamb	12.9000	0.0940	1.2126
E5 Ground floor (normal)	20.3000	0.0670	1.3601
E7 Party floor between dwellings (in blocks of flats)	20.3000	0.0320	0.6496
E16 Corner (normal)	12.6000	0.0680	0.8568
E17 Corner (inverted - internal area greater than external area)	2.5200	-0.0290	-0.0731
P1 Party wall - Ground floor	5.9000	0.0560	0.3304
E18 Party wall between dwellings	2.5200	0.2400	0.6048
E25 Staggered party wall between dwellings	2.5200	0.0560	0.1411

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.8466 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 20.4166 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	7.7840	7.6788	7.6788	7.2577	7.3630	6.8367	6.6262	6.6262	6.8367	7.2577	7.2577	7.3630	(38)
Heat transfer coeff	28.2007	28.0954	28.0954	27.6744	27.7796	27.2534	27.0429	27.0429	27.2534	27.6744	27.6744	27.7796	(39)
Average = Sum(39)m / 12 =												27.6305	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7427	0.7399	0.7399	0.7288	0.7316	0.7178	0.7122	0.7122	0.7178	0.7288	0.7288	0.7316	(40)
HLP (average)												0.7277	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.3535 (42)
Hot water usage for mixer showers

46.9130	46.2079	45.1806	43.2150	41.7644	40.1467	39.2272	40.2468	41.3644	43.1013	45.1092	46.7332	(42a)

Hot water usage for baths

20.2973	19.9959	19.5714	18.7887	18.2026	17.5528	17.2017	17.6233	18.0822	18.7776	19.5764	20.2287	(42b)

Hot water usage for other uses

28.4911	27.4550	26.4190	25.3830	24.3469	23.3109	23.3109	24.3469	25.3830	26.4190	27.4550	28.4911	(42c)

Average daily hot water use (litres/day) 87.9720 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	95.7014	93.6589	91.1710	87.3866	84.3139	81.0104	79.7399	82.2170	84.8296	88.2979	92.1406	95.4530	(44)
Energy conte	151.5676	133.3690	140.1264	119.6279	113.5028	99.6117	96.4385	101.8018	104.6034	119.8195	131.2712	149.4563	(45)
Energy content (annual)										Total = Sum(45)m =		1461.1961	
Distribution loss (46)m = 0.15 x (45)m	22.7351	20.0053	21.0190	17.9442	17.0254	14.9418	14.4658	15.2703	15.6905	17.9729	19.6907	22.4185	(46)

Water storage loss:
Store volume 200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.6100 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.8694 (55)
Total storage loss

26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)

If cylinder contains dedicated solar storage

26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

178.5190	157.7122	167.0778	145.7099	140.4542	125.6937	123.3899	128.7532	130.6854	146.7709	157.3532	176.4077	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

178.5190	157.7122	167.0778	145.7099	140.4542	125.6937	123.3899	128.7532	130.6854	146.7709	157.3532	176.4077	(64)
									Total per year (kWh/year) = Sum(64)m =		1778.5271	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

	50.3962	44.3452	46.5920	39.7763	37.7397	33.1209	32.0658	33.8491	34.7806	39.8400	43.6477	49.6942 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	81.2094	81.2094	81.2094	81.2094	81.2094	81.2094	81.2094	81.2094	81.2094	81.2094	81.2094	81.2094	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	14.9303	13.2610	10.7845	8.1646	6.1031	5.1525	5.5675	7.2368	9.7132	12.3332	14.3947	15.3453 (67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	173.8268	175.6306	171.0851	161.4084	149.1932	137.7127	130.0430	128.2392	132.7847	142.4614	154.6766	166.1571 (68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	44.4744	44.4744	44.4744	44.4744	44.4744	44.4744	44.4744	44.4744	44.4744	44.4744	44.4744	44.4744 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)

Losses e.g. evaporation (negative values) (Table 5)

	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396 (71)

Water heating gains (Table 5)

	67.7369	65.9899	62.6237	55.2449	50.7254	46.0012	43.0992	45.4961	48.3064	53.5483	60.6218	66.7933 (72)

Total internal gains

	328.0382	326.4256	316.0376	296.3620	277.5659	260.4106	250.2538	252.5163	262.3486	279.8872	301.2372	319.8399 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	1.6600	8.9975	0.3800	0.0000	0.7700	4.3702	(74)
South	2.8100	39.5594	0.3800	0.0000	0.7700	32.5260	(78)
West	0.7200	16.6187	0.3800	0.0000	0.7700	3.5011	(80)

Solar gains	40.3973	71.9279	103.4013	130.6221	144.0985	146.4262	138.0991	123.7917	113.2078	82.4941	50.1743	37.0263	(83)
Total gains	368.4355	398.3535	419.4389	426.9841	421.6644	406.8368	388.3529	376.3081	375.5564	362.3813	351.4116	356.8662	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	50.5527	50.7421	50.7421	51.5140	51.3188	52.3098	52.7170	52.7170	52.3098	51.5140	51.5140	51.3188	
alpha	4.3702	4.3828	4.3828	4.4343	4.4213	4.4873	4.5145	4.5145	4.4873	4.4343	4.4343	4.4213	
util living area	0.8914	0.8532	0.7963	0.6892	0.5512	0.3979	0.3054	0.3220	0.4892	0.7024	0.8401	0.8997	(86)
MIT	20.3416	20.4917	20.6597	20.8513	20.9534	20.9917	20.9980	20.9974	20.9782	20.8601	20.6049	20.3227	(87)
Th 2	20.3033	20.3057	20.3057	20.3154	20.3130	20.3252	20.3301	20.3301	20.3252	20.3154	20.3154	20.3130	(88)
util rest of house	0.8782	0.8365	0.7746	0.6594	0.5126	0.3545	0.2593	0.2747	0.4447	0.6681	0.8197	0.8873	(89)
MIT 2	19.5534	19.7364	19.9360	20.1647	20.2714	20.3192	20.3289	20.3286	20.3079	20.1782	19.8847	19.5386	(90)
Living area fraction									fLA = Living area / (4) =			0.4772	(91)
MIT	19.9295	20.0968	20.2814	20.4923	20.5968	20.6401	20.6482	20.6478	20.6278	20.5036	20.2284	19.9128	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9295	20.0968	20.2814	20.4923	20.5968	20.6401	20.6482	20.6478	20.6278	20.5036	20.2284	19.9128	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8704	0.8312	0.7738	0.6673	0.5288	0.3748	0.2812	0.2972	0.4648	0.6778	0.8170	0.8793	(94)
Useful gains	320.6707	331.0990	324.5569	284.9162	222.9664	152.4937	109.2167	111.8343	174.5727	245.6363	287.0870	313.8072	(95)
Ext temp.	4.7000	5.3000	6.7000	9.3000	12.3000	15.0000	16.6000	16.5000	14.1000	10.8000	7.5000	4.6000	(96)
Heat loss rate W	429.4825	415.7223	381.5738	309.7412	230.4835	153.7123	109.4757	112.1681	177.9038	268.5425	352.2503	425.3837	(97)
Space heating kWh	80.9560	56.8669	42.4206	17.8740	5.5927	0.0000	0.0000	0.0000	0.0000	17.0422	46.9175	83.0129	(98a)
Space heating requirement - total per year (kWh/year)												350.6829	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	80.9560	56.8669	42.4206	17.8740	5.5927	0.0000	0.0000	0.0000	0.0000	17.0422	46.9175	83.0129	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												350.6829	
Space heating per m2											(98c) / (4) =	9.2358	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	80.9560	56.8669	42.4206	17.8740	5.5927	0.0000	0.0000	0.0000	0.0000	17.0422	46.9175	83.0129	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	80.9560	56.8669	42.4206	17.8740	5.5927	0.0000	0.0000	0.0000	0.0000	17.0422	46.9175	83.0129	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)

Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement													
	178.5190	157.7122	167.0778	145.7099	140.4542	125.6937	123.3899	128.7532	130.6854	146.7709	157.3532	176.4077	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month													
	55.0102	48.5986	51.4846	44.9001	43.2806	38.7322	38.0223	39.6750	40.2704	45.2271	48.4880	54.3596	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	11.3091	10.2147	11.3091	10.9443	11.3091	10.9443	11.3091	11.3091	10.9443	11.3091	10.9443	11.3091	(231)
Lighting	13.0684	10.4840	9.4397	6.9159	5.3420	4.3645	4.8732	6.3343	8.2277	10.7952	12.1931	13.4316	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	350.6829	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	324.5200	
Water heating fuel used	548.0485	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.2180)		
mechanical ventilation fans (SFP = 1.2180)	133.1557	(230a)
Total electricity for the above, kWh/year	133.1557	(231)
Electricity for lighting (calculated in Appendix L)	105.4696	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	1137.3567	(238)

10a. Fuel costs - using BEDF prices (583)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	350.6829	28.4300	99.6991	(240)
Space heating - main system 2	0.0000	28.4300	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	548.0485	28.4300	155.8102	(247)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(247a)
Pumps, fans and electric keep-hot	133.1557	28.4300	37.8562	(249)
Energy for lighting	105.4696	28.4300	29.9850	(250)
Additional standing charges			0.0000	(251)
Total energy cost			323.3505	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	350.6829	0.1569	55.0125	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	548.0485	0.1411	77.3114	(264)
Space and water heating			132.3239	(265)
Pumps, fans and electric keep-hot	133.1557	0.1387	18.4703	(267)
Energy for lighting	105.4696	0.1443	15.2225	(268)
Total CO2, kg/year			166.0168	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	350.6829	1.5807	554.3413	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	548.0485	1.5216	833.9227	(278)
Space and water heating			1388.2640	(279)
Pumps, fans and electric keep-hot	133.1557	1.5128	201.4379	(281)
Energy for lighting	105.4696	1.5338	161.7728	(282)
Total Primary energy kWh/year			1751.4747	(286)

SAP 10 EPC IMPROVEMENTS

001

Current energy efficiency rating: B 86
Current environmental impact rating: A 97

N Solar water heating Not applicable
U Solar photovoltaic panels Not applicable
V2 Wind turbine Not applicable

Recommended measures: SAP change Cost change CO2 change
(none)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: B 86
Potential environmental impact rating: A 97

Fuel prices for cost data on this page from database revision number 583 TEST (01 Oct 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, West Pennines (England)):

	Current	Potential	Saving
Electricity	£323	£323	£0
Space heating	£138	£138	£0
Water heating	£156	£156	£0
Lighting	£30	£30	£0
Total cost of fuels	£323	£323	£0
Total cost of uses	£324	£324	£0
Delivered energy	30 kWh/m²	30 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.2 tonnes	0.2 tonnes	0.0 tonnes
CO2 emissions per m²	4 kg/m²	4 kg/m²	0 kg/m²
Primary energy	46 kWh/m²	46 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	37.9700	(1b)	x 2.3600	(2b) =	89.6092	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	37.9700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		89.6092	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.3500	(17)
Infiltration rate		0.1675	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1424	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1815	0.1780	0.1744	0.1566	0.1531	0.1353	0.1353	0.1317	0.1424	0.1531	0.1602	0.1673	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	80.1000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2810	0.2775	0.2739	0.2561	0.2526	0.2348	0.2348	0.2312	0.2419	0.2526	0.2597	0.2668	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Door			2.1500	0.7800	1.6770			(26)
Window			5.1900	0.7282	3.7791			(27)
GF			37.9700	0.0900	3.4173	75.0000	2847.7500	(28a)
Main	51.1600	7.3400	43.8200	0.1300	5.6966	9.0000	394.3800	(29a)
Total net area of external elements Aum(A, m2)			89.1300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		14.5700			(33)
Main dwelling								
Party Wall 1			14.8700	0.0000	0.0000	20.0000	297.4000	(32)
Party Ceiling			37.9700			30.0000	1139.1000	(32b)
Timber			50.4000			9.0000	453.6000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	5132.2300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		135.1654 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	5.7900	0.1150	0.6659
E3 Sill	5.7900	0.0170	0.0984
E4 Jamb	12.9000	0.0940	1.2126
E5 Ground floor (normal)	20.3000	0.0670	1.3601
E7 Party floor between dwellings (in blocks of flats)	20.3000	0.0320	0.6496
E16 Corner (normal)	12.6000	0.0680	0.8568
E17 Corner (inverted - internal area greater than external area)	2.5200	-0.0290	-0.0731
P1 Party wall - Ground floor	5.9000	0.0560	0.3304
E18 Party wall between dwellings	2.5200	0.2400	0.6048
E25 Staggered party wall between dwellings	2.5200	0.0560	0.1411

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		5.8466 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	20.4166 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	8.3103	8.2050	8.0998	7.5735	7.4683	6.9420	6.9420	6.8367	7.1525	7.4683	7.6788	7.8893	(38)
Heat transfer coeff	28.7269	28.6217	28.5164	27.9902	27.8849	27.3586	27.3586	27.2534	27.5691	27.8849	28.0954	28.3059	(39)
Average = Sum(39)m / 12 =												27.9638	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7566	0.7538	0.7510	0.7372	0.7344	0.7205	0.7205	0.7178	0.7261	0.7344	0.7399	0.7455	(40)
HLP (average)												0.7365	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy		1.3535 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	46.9130	46.2079	45.1806	43.2150	41.7644	40.1467	39.2272	40.2468	41.3644	43.1013	45.1092	46.7332	(42a)
Hot water usage for baths	20.2973	19.9959	19.5714	18.7887	18.2026	17.5528	17.2017	17.6233	18.0822	18.7776	19.5764	20.2287	(42b)
Hot water usage for other uses	28.4911	27.4550	26.4190	25.3830	24.3469	23.3109	23.3109	24.3469	25.3830	26.4190	27.4550	28.4911	(42c)
Average daily hot water use (litres/day)												87.9720	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	95.7014	93.6589	91.1710	87.3866	84.3139	81.0104	79.7399	82.2170	84.8296	88.2979	92.1406	95.4530	(44)
Energy conte	151.5676	133.3690	140.1264	119.6279	113.5028	99.6117	96.4385	101.8018	104.6034	119.8195	131.2712	149.4563	(45)
Energy content (annual)										Total = Sum(45)m =		1461.1961	
Distribution loss (46)m = 0.15 x (45)m	22.7351	20.0053	21.0190	17.9442	17.0254	14.9418	14.4658	15.2703	15.6905	17.9729	19.6907	22.4185	(46)
Water storage loss:													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8694	(55)
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	178.5190	157.7122	167.0778	145.7099	140.4542	125.6937	123.3899	128.7532	130.6854	146.7709	157.3532	176.4077	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	178.5190	157.7122	167.0778	145.7099	140.4542	125.6937	123.3899	128.7532	130.6854	146.7709	157.3532	176.4077	(64)
										Total per year (kWh/year) = Sum(64)m =		1778.5271	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	50.3962	44.3452	46.5920	39.7763	37.7397	33.1209	32.0658	33.8491	34.7806	39.8400	43.6477	49.6942	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	81.2094	81.2094	81.2094	81.2094	81.2094	81.2094	81.2094	81.2094	81.2094	81.2094	81.2094	81.2094	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	14.9303	13.2610	10.7845	8.1646	6.1031	5.1525	5.5675	7.2368	9.7132	12.3332	14.3947	15.3453	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	173.8268	175.6306	171.0851	161.4084	149.1932	137.7127	130.0430	128.2392	132.7847	142.4614	154.6766	166.1571	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	44.4744	44.4744	44.4744	44.4744	44.4744	44.4744	44.4744	44.4744	44.4744	44.4744	44.4744	44.4744	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	(71)

Water heating gains (Table 5)

	67.7369	65.9899	62.6237	55.2449	50.7254	46.0012	43.0992	45.4961	48.3064	53.5483	60.6218	66.7933 (72)
Total internal gains												
	328.0382	326.4256	316.0376	296.3620	277.5659	260.4106	250.2538	252.5163	262.3486	279.8872	301.2372	319.8399 (73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	1.6600	10.6334	0.3800	0.0000	0.7700	5.1648	(74)
South	2.8100	46.7521	0.3800	0.0000	0.7700	38.4398	(78)
West	0.7200	19.6403	0.3800	0.0000	0.7700	4.1377	(80)

Solar gains	47.7423	80.9189	110.2947	137.0162	154.5638	154.1328	148.2996	134.9674	119.4394	89.2559	57.0949	40.9238	(83)
Total gains	375.7805	407.3445	426.3323	433.3782	432.1297	414.5435	398.5534	387.4837	381.7880	369.1431	358.3322	360.7637	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	49.6266	49.8091	49.9929	50.9329	51.1251	52.1086	52.1086	52.3098	51.7107	51.1251	50.7421	50.3647	
alpha	4.3084	4.3206	4.3329	4.3955	4.4083	4.4739	4.4739	4.4873	4.4474	4.4083	4.3828	4.3576	
util living area													
	0.8959	0.8585	0.7998	0.7029	0.5731	0.4172	0.3010	0.3222	0.4867	0.7058	0.8475	0.9062	(86)
MIT	20.2853	20.4445	20.6373	20.8289	20.9414	20.9891	20.9980	20.9973	20.9778	20.8519	20.5638	20.2551	(87)
Th 2	20.2911	20.2936	20.2960	20.3081	20.3106	20.3227	20.3227	20.3252	20.3179	20.3106	20.3057	20.3008	(88)
util rest of house													
	0.8832	0.8425	0.7785	0.6741	0.5363	0.3747	0.2551	0.2755	0.4419	0.6722	0.8281	0.8946	(89)
MIT 2	19.4740	19.6686	19.9009	20.1328	20.2567	20.3146	20.3216	20.3236	20.3003	20.1644	19.8270	19.4453	(90)
Living area fraction									fLA = Living area / (4) =			0.4772	(91)
MIT	19.8612	20.0389	20.2523	20.4650	20.5834	20.6365	20.6444	20.6451	20.6236	20.4925	20.1786	19.8317	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8612	20.0389	20.2523	20.4650	20.5834	20.6365	20.6444	20.6451	20.6236	20.4925	20.1786	19.8317	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8747	0.8362	0.7771	0.6808	0.5511	0.3945	0.2770	0.2977	0.4622	0.6813	0.8243	0.8859	(94)
Useful gains	328.7012	340.6388	331.2891	295.0507	238.1466	163.5210	110.3904	115.3350	176.4482	251.5146	295.3751	319.6118	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	447.0243	433.2999	392.1672	323.7063	247.7132	165.1496	110.6494	115.6933	179.8496	275.8502	367.4498	442.4700	(97)
Space heating kWh													
	88.0324	62.2683	45.2933	20.6320	7.1175	0.0000	0.0000	0.0000	0.0000	18.1056	51.8938	91.4065	(98a)
Space heating requirement - total per year (kWh/year)												384.7494	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	88.0324	62.2683	45.2933	20.6320	7.1175	0.0000	0.0000	0.0000	0.0000	18.1056	51.8938	91.4065	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												384.7494	
Space heating per m2											(98c) / (4) =	10.1330	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	88.0324	62.2683	45.2933	20.6320	7.1175	0.0000	0.0000	0.0000	0.0000	18.1056	51.8938	91.4065	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	88.0324	62.2683	45.2933	20.6320	7.1175	0.0000	0.0000	0.0000	0.0000	18.1056	51.8938	91.4065	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement													
	178.5190	157.7122	167.0778	145.7099	140.4542	125.6937	123.3899	128.7532	130.6854	146.7709	157.3532	176.4077	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month													
	55.0102	48.5986	51.4846	44.9001	43.2806	38.7322	38.0223	39.6750	40.2704	45.2271	48.4880	54.3596	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	11.3091	10.2147	11.3091	10.9443	11.3091	10.9443	11.3091	11.3091	10.9443	11.3091	10.9443	11.3091	(231)
Lighting	13.0684	10.4840	9.4397	6.9159	5.3420	4.3645	4.8732	6.3343	8.2277	10.7952	12.1931	13.4316	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													

(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	384.7494	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	324.5200	
Water heating fuel used	548.0485	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.2180)		
mechanical ventilation fans (SFP = 1.2180)	133.1557	(230a)
Total electricity for the above, kWh/year	133.1557	(231)
Electricity for lighting (calculated in Appendix L)	105.4696	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	1171.4233	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	384.7494	16.4900	63.4452	(240)
Space heating - main system 2	0.0000	16.4900	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	548.0485	16.4900	90.3732	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	133.1557	16.4900	21.9574	(249)
Energy for lighting	105.4696	16.4900	17.3919	(250)
Additional standing charges			0.0000	(251)
Total energy cost			193.1677	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.8381	(257)
SAP value		86.4138	
SAP rating (Section 12)		86	(258)
SAP band		B	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	384.7494	0.1568	60.3296	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	548.0485	0.1411	77.3114	(264)
Space and water heating			137.6410	(265)
Pumps, fans and electric keep-hot	133.1557	0.1387	18.4703	(267)
Energy for lighting	105.4696	0.1443	15.2225	(268)
Total CO2, kg/year			171.3339	(272)
CO2 emissions per m2			4.5100	(273)
EI value			97.2329	
EI rating			97	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		37.9700	(1b)	x 2.3600	(2b) =	89.6092	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	37.9700						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		89.6092	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.3500	(17)
Infiltration rate		0.1675	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1424	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.6000	4.5000	4.5000	4.1000	4.2000	3.7000	3.5000	3.5000	3.7000	4.1000	4.1000	4.2000	(22)
Wind factor	1.1500	1.1250	1.1250	1.0250	1.0500	0.9250	0.8750	0.8750	0.9250	1.0250	1.0250	1.0500	(22a)
Adj infilt rate	0.1637	0.1602	0.1602	0.1459	0.1495	0.1317	0.1246	0.1246	0.1317	0.1459	0.1459	0.1495	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	80.1000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2632	0.2597	0.2597	0.2454	0.2490	0.2312	0.2241	0.2241	0.2312	0.2454	0.2454	0.2490	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Door			2.1500	0.7800	1.6770			(26)
Window			5.1900	0.7282	3.7791			(27)
GF			37.9700	0.0900	3.4173	75.0000	2847.7500	(28a)
Main	51.1600	7.3400	43.8200	0.1300	5.6966	9.0000	394.3800	(29a)
Total net area of external elements Aum(A, m2)			89.1300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		14.5700			(33)
Main dwelling								
Party Wall 1			14.8700	0.0000	0.0000	20.0000	297.4000	(32)
Party Ceiling			37.9700			30.0000	1139.1000	(32b)
Timber			50.4000			9.0000	453.6000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	5132.2300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		135.1654 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	5.7900	0.1150	0.6659
E3 Sill	5.7900	0.0170	0.0984
E4 Jamb	12.9000	0.0940	1.2126
E5 Ground floor (normal)	20.3000	0.0670	1.3601
E7 Party floor between dwellings (in blocks of flats)	20.3000	0.0320	0.6496
E16 Corner (normal)	12.6000	0.0680	0.8568
E17 Corner (inverted - internal area greater than external area)	2.5200	-0.0290	-0.0731
P1 Party wall - Ground floor	5.9000	0.0560	0.3304
E18 Party wall between dwellings	2.5200	0.2400	0.6048
E25 Staggered party wall between dwellings	2.5200	0.0560	0.1411

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		5.8466	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	20.4166	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	7.7840	7.6788	7.6788	7.2577	7.3630	6.8367	6.6262	6.6262	6.8367	7.2577	7.2577	7.3630	(38)
Heat transfer coeff	28.2007	28.0954	28.0954	27.6744	27.7796	27.2534	27.0429	27.0429	27.2534	27.6744	27.6744	27.7796	(39)
Average = Sum(39)m / 12 =												27.6305	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7427	0.7399	0.7399	0.7288	0.7316	0.7178	0.7122	0.7122	0.7178	0.7288	0.7288	0.7316	(40)
HLP (average)												0.7277	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.3535	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	46.9130	46.2079	45.1806	43.2150	41.7644	40.1467	39.2272	40.2468	41.3644	43.1013	45.1092	46.7332	(42a)
Hot water usage for baths	20.2973	19.9959	19.5714	18.7887	18.2026	17.5528	17.2017	17.6233	18.0822	18.7776	19.5764	20.2287	(42b)
Hot water usage for other uses	28.4911	27.4550	26.4190	25.3830	24.3469	23.3109	23.3109	24.3469	25.3830	26.4190	27.4550	28.4911	(42c)
Average daily hot water use (litres/day)												87.9720	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	95.7014	93.6589	91.1710	87.3866	84.3139	81.0104	79.7399	82.2170	84.8296	88.2979	92.1406	95.4530	(44)
Energy conte	151.5676	133.3690	140.1264	119.6279	113.5028	99.6117	96.4385	101.8018	104.6034	119.8195	131.2712	149.4563	(45)
Energy content (annual)										Total = Sum(45)m =		1461.1961	
Distribution loss (46)m = 0.15 x (45)m	22.7351	20.0053	21.0190	17.9442	17.0254	14.9418	14.4658	15.2703	15.6905	17.9729	19.6907	22.4185	(46)

Water storage loss:	
Store volume	200.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.6100 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.8694 (55)
Total storage loss
26.9514 24.3432 26.9514 26.0820 26.9514 26.0820 26.9514 26.9514 26.0820 26.9514 26.0820 26.9514 (56)
If cylinder contains dedicated solar storage
26.9514 24.3432 26.9514 26.0820 26.9514 26.0820 26.9514 26.9514 26.0820 26.9514 26.0820 26.9514 (57)
Primary loss 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (59)
Combi loss 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (61)
Total heat required for water heating calculated for each month
178.5190 157.7122 167.0778 145.7099 140.4542 125.6937 123.3899 128.7532 130.6854 146.7709 157.3532 176.4077 (62)
WWHRS 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (63a)
PV diverter 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (63b)
Solar input 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (63c)
FGHRS 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (63d)
Output from w/h
178.5190 157.7122 167.0778 145.7099 140.4542 125.6937 123.3899 128.7532 130.6854 146.7709 157.3532 176.4077 (64)
Total per year (kWh/year) = Sum(64)m = 1778.5271 (64)
Electric shower(s)
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)
Heat gains from water heating, kWh/month
50.3962 44.3452 46.5920 39.7763 37.7397 33.1209 32.0658 33.8491 34.7806 39.8400 43.6477 49.6942 (65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	81.2094	81.2094	81.2094	81.2094	81.2094	81.2094	81.2094	81.2094	81.2094	81.2094	81.2094	81.2094	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5
14.9303 13.2610 10.7845 8.1646 6.1031 5.1525 5.5675 7.2368 9.7132 12.3332 14.3947 15.3453 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5
173.8268 175.6306 171.0851 161.4084 149.1932 137.7127 130.0430 128.2392 132.7847 142.4614 154.6766 166.1571 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5
44.4744 44.4744 44.4744 44.4744 44.4744 44.4744 44.4744 44.4744 44.4744 44.4744 44.4744 44.4744 (69)
Pumps, fans 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)
-54.1396 -54.1396 -54.1396 -54.1396 -54.1396 -54.1396 -54.1396 -54.1396 -54.1396 -54.1396 -54.1396 -54.1396 (71)
Water heating gains (Table 5)
67.7369 65.9899 62.6237 55.2449 50.7254 46.0012 43.0992 45.4961 48.3064 53.5483 60.6218 66.7933 (72)
Total internal gains
328.0382 326.4256 316.0376 296.3620 277.5659 260.4106 250.2538 252.5163 262.3486 279.8872 301.2372 319.8399 (73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	1.6600	8.9975	0.3800	0.0000	0.7700	4.3702	(74)
South	2.8100	39.5594	0.3800	0.0000	0.7700	32.5260	(78)
West	0.7200	16.6187	0.3800	0.0000	0.7700	3.5011	(80)

Solar gains 40.3973 71.9279 103.4013 130.6221 144.0985 146.4262 138.0991 123.7917 113.2078 82.4941 50.1743 37.0263 (83)
Total gains 368.4355 398.3535 419.4389 426.9841 421.6644 406.8368 388.3529 376.3081 375.5564 362.3813 351.4116 356.8662 (84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	50.5527	50.7421	50.7421	51.5140	51.3188	52.3098	52.7170	52.7170	52.3098	51.5140	51.5140	51.3188	
alpha	4.3702	4.3828	4.3828	4.4343	4.4213	4.4873	4.5145	4.5145	4.4873	4.4343	4.4343	4.4213	
util living area	0.8914	0.8532	0.7963	0.6892	0.5512	0.3979	0.3054	0.3220	0.4892	0.7024	0.8401	0.8997	(86)
MIT	20.3416	20.4917	20.6597	20.8513	20.9534	20.9917	20.9980	20.9974	20.9782	20.8601	20.6049	20.3227	(87)
Th 2	20.3033	20.3057	20.3057	20.3154	20.3130	20.3252	20.3301	20.3301	20.3252	20.3154	20.3154	20.3130	(88)
util rest of house	0.8782	0.8365	0.7746	0.6594	0.5126	0.3545	0.2593	0.2747	0.4447	0.6681	0.8197	0.8873	(89)
MIT 2	19.5534	19.7364	19.9360	20.1647	20.2714	20.3192	20.3289	20.3286	20.3079	20.1782	19.8847	19.5386	(90)
Living area fraction									fLA = Living area / (4) =			0.4772	(91)
MIT	19.9295	20.0968	20.2814	20.4923	20.5968	20.6401	20.6482	20.6478	20.6278	20.5036	20.2284	19.9128	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9295	20.0968	20.2814	20.4923	20.5968	20.6401	20.6482	20.6478	20.6278	20.5036	20.2284	19.9128	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8704	0.8312	0.7738	0.6673	0.5288	0.3748	0.2812	0.2972	0.4648	0.6778	0.8170	0.8793	(94)
Useful gains	320.6707	331.0990	324.5569	284.9162	222.9664	152.4937	109.2167	111.8343	174.5727	245.6363	287.0870	313.8072	(95)
Ext temp.	4.7000	5.3000	6.7000	9.3000	12.3000	15.0000	16.6000	16.5000	14.1000	10.8000	7.5000	4.6000	(96)
Heat loss rate W	429.4825	415.7223	381.5738	309.7412	230.4835	153.7123	109.4757	112.1681	177.9038	268.5425	352.2503	425.3837	(97)
Space heating kWh	80.9560	56.8669	42.4206	17.8740	5.5927	0.0000	0.0000	0.0000	0.0000	17.0422	46.9175	83.0129	(98a)
Space heating requirement - total per year (kWh/year)												350.6829	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	80.9560	56.8669	42.4206	17.8740	5.5927	0.0000	0.0000	0.0000	0.0000	17.0422	46.9175	83.0129	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												350.6829	
Space heating per m2											(98c) / (4) =	9.2358	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Fraction of main heating from main system 2												0.0000	(203)
Fraction of total heating from main system 1												1.0000	(204)
Fraction of total heating from main system 2												0.0000	(205)
Efficiency of main space heating system 1 (in %)												100.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	80.9560	56.8669	42.4206	17.8740	5.5927	0.0000	0.0000	0.0000	0.0000	17.0422	46.9175	83.0129	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	80.9560	56.8669	42.4206	17.8740	5.5927	0.0000	0.0000	0.0000	0.0000	17.0422	46.9175	83.0129	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement													
	178.5190	157.7122	167.0778	145.7099	140.4542	125.6937	123.3899	128.7532	130.6854	146.7709	157.3532	176.4077	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month													
	55.0102	48.5986	51.4846	44.9001	43.2806	38.7322	38.0223	39.6750	40.2704	45.2271	48.4880	54.3596	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	11.3091	10.2147	11.3091	10.9443	11.3091	10.9443	11.3091	11.3091	10.9443	11.3091	10.9443	11.3091	(231)
Lighting	13.0684	10.4840	9.4397	6.9159	5.3420	4.3645	4.8732	6.3343	8.2277	10.7952	12.1931	13.4316	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												350.6829	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												324.5200	
Water heating fuel used												548.0485	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.2180)													
mechanical ventilation fans (SFP = 1.2180)												133.1557	(230a)
Total electricity for the above, kWh/year												133.1557	(231)
Electricity for lighting (calculated in Appendix L)												105.4696	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												1137.3567	(238)

10a. Fuel costs - using BEDF prices (583)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	350.6829	28.4300	99.6991	(240)
Space heating - main system 2	0.0000	28.4300	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	548.0485	28.4300	155.8102	(247)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(247a)
Pumps, fans and electric keep-hot	133.1557	28.4300	37.8562	(249)
Energy for lighting	105.4696	28.4300	29.9850	(250)
Additional standing charges			0.0000	(251)
Total energy cost			323.3505	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	350.6829	0.1569	55.0125	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	548.0485	0.1411	77.3114	(264)
Space and water heating			132.3239	(265)
Pumps, fans and electric keep-hot	133.1557	0.1387	18.4703	(267)
Energy for lighting	105.4696	0.1443	15.2225	(268)
Total CO2, kg/year			166.0168	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	350.6829	1.5807	554.3413	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	548.0485	1.5216	833.9227	(278)
Space and water heating			1388.2640	(279)
Pumps, fans and electric keep-hot	133.1557	1.5128	201.4379	(281)
Energy for lighting	105.4696	1.5338	161.7728	(282)
Total Primary energy kWh/year			1751.4747	(286)

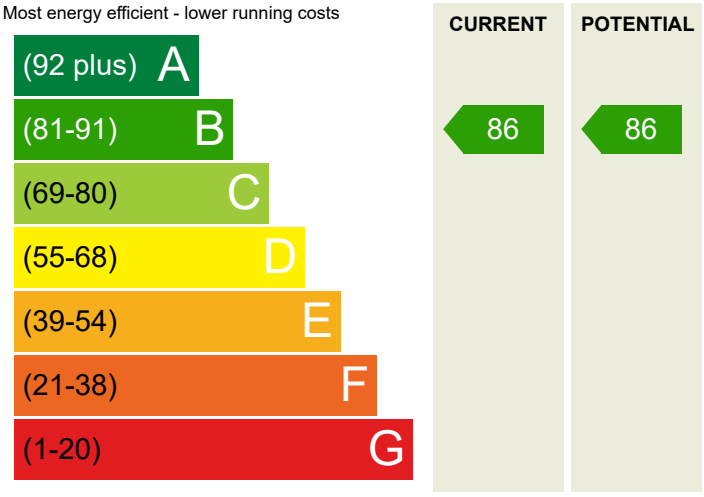
Energy Report

Dwelling Address	12 Shepherd Street, MANCHESTER, M9 4QW
Reference	78449-19-001
Assessment Date	02/07/2025
Submission Date	18/08/2025
Property Type	Flat, End-Terrace
Total Floor Area	38

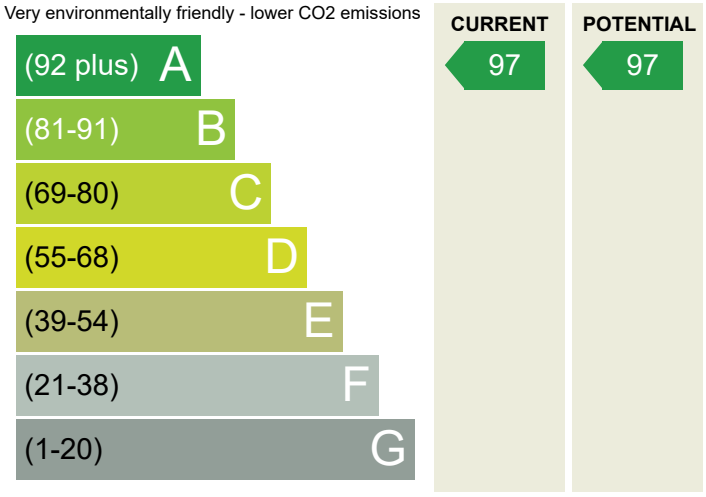
This Energy Report has been generated using the UK's National Calculation Methodology for dwellings, Standard Assessment Procedure (SAP). This methodology is used to assess the energy efficiency of dwellings which is calculated based on a dwelling's heating, hot water, ventilation and lighting usage.

This document is not an Energy Performance Certificate (EPC) as required by the Energy Performance of Buildings Regulations

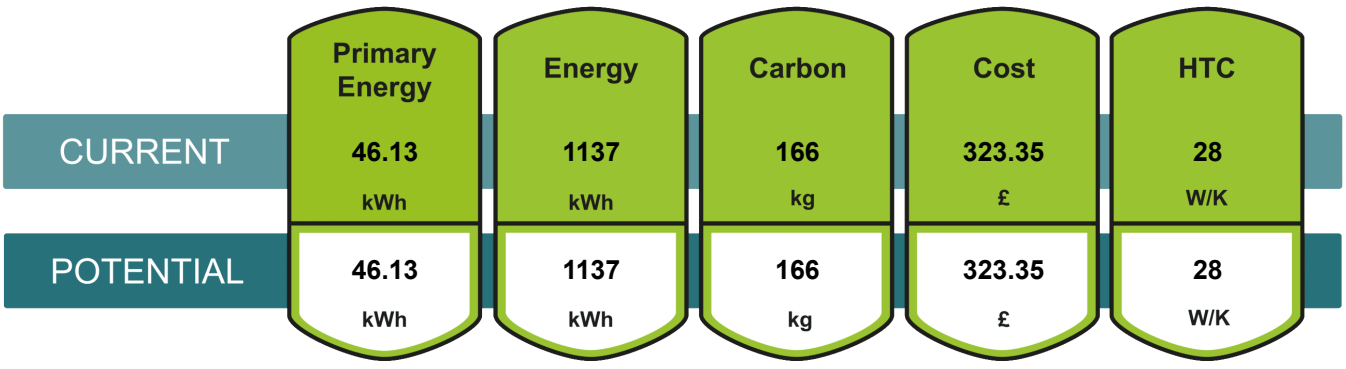
Energy Efficiency Rating



Carbon Dioxide (CO2) Emissions Rating



Additional ratings for your home



Energy Report

Breakdown of property's energy performance

Each feature is assessed as one of the following:

Very Poor	Poor	Average	Good	Very Good

Feature	Description	Energy Performance
Walls	Average thermal transmittance 0.13 W/m²K	Very Good
Floor	Average thermal transmittance 0.09 W/m²K	Very Good
Windows	High performance glazing	Very Good
Main heating	Room heaters, electric	Very Poor
Main heating controls	Programmer and room thermostat	Good
Secondary heating	None	
Hot water	From main system	Very Good
Lighting	Good lighting efficiency	Good
Air tightness	Air permeability [AP50] = 3.4 m³/h.m² (as tested)	Good

Recommendations

The recommended measures provided below will help to improve the energy efficiency of the dwelling.
To reach the dwelling's potential energy rating all of the recommended measures shown below would need to be installed.
Having these measures installed individually or in any other order may give a different result when compared with the cumulative potential rating.

Recommended measures	Cumulative savings (per year)	Cumulative rating	Typical costs	Incremental savings (per year)	Cumulative CO2 rating

The typical cost is based on average installation prices across the country so may not be representative of the actual costs in your area.

Estimated energy costs of the dwelling

Energy Report

The table below shows the estimated running costs of the space and water heating and lighting within the dwelling. It does not include the energy used from household appliances. The estimated annual costs after potential improvements indicates the total energy cost if all recommended measures named above were installed.

	Estimated annual costs	Estimated annual costs after potential improvements	Potential future savings
Lighting	£30	£30	
Heating	£138	£138	
Hot Water	£156	£156	
New Technologies e.g. Impact of PV	£0	£0	
TOTAL	£323	£323	

Estimated energy use and potential savings

Space Heating
351
kWh per year

Water Heating
548
kWh per year

About this document

Created by:	
Company/Trading name:	
Phone number:	
Email address:	

Disclaimer

This Energy Report should not under any circumstances be treated as a Condition Survey and cannot be used to indicate that any element of the dwelling (e.g.heating system) is working correctly.
This Energy Report must not be used in situations where an Energy Performance Certificate (EPC) is required.
This Energy Report is generated from a set of data inputs which may not reflect the actual dimensions, services or construction of the dwelling.
The calculation used to generate this report reflects the SAP Methodology current at the time of report generation.

Glossary terms for additional metrics

Primary Energy	The measure of the energy required for lighting, heating and hot water in a property. This includes the efficiency of the property's heating system, power station efficiency for electricity and the energy used to produce the fuel and deliver it to the property.
Energy Used	The estimated amount of fuel energy for lighting, heating and hot water for the property. The estimate is based on typical usage which is likely to be different to actual consumption.
Carbon (CO2)	The current emissions based on the energy estimates.
Cost	The estimated cost of energy. The cost of each unit of fuel is based on an industry standard which is likely to be different to those the occupier actually pays.
Heat Transfer Coefficient	Heat flow through the property envelope where internal and external temperatures are different.

Building Regulations England Part L (BREL) Compliance Report

Approved Document L1 2021 Edition, England assessed by Array SAP 10 program, Array

Date: Fri 03 Oct 2025 15:03:30

Project Information			
Assessed By	Paul Goddard	Building Type	Flat, End-terrace
OCDEA Registration	EES/005113	Assessment Date	2025-10-03

Dwelling Details			
Assessment Type	As built	Total Floor Area	49 m^2
Site Reference	78449-20	Plot Reference	001
Address	10 Shepherd Street, MANCHESTER, M9 4QW		

Client Details	
Name	-
Company	John Southworth
Address	Unit 10, Charles Street, DUKINFIELD, SK16 4SD

This report covers items included within the SAP calculations. It is not a complete report of regulations compliance.

1a Target emission rate and dwelling emission rate		
Fuel for main heating system	Electricity	
Target carbon dioxide emission rate	*15.12 $kgCO_2/m^2$*	
Dwelling carbon dioxide emission rate	5.82 $kgCO_2/m^2$	**OK**
1b Target primary energy rate and dwelling primary energy		
Target primary energy	*79.82 kWh_{PE}/m^2*	
Dwelling primary energy	60.83 kWh_{PE}/m^2	**OK**
1c Target fabric energy efficiency and dwelling fabric energy efficiency		
Target fabric energy efficiency	*40.7 kWh/m^2*	
Dwelling fabric energy efficiency	36.6 kWh/m^2	**OK**

2a Fabric U-values				
Element	***Maximum permitted average U-Value [W/m^2K]***	**Dwelling average U-Value [W/m^2K]**	**Element with highest individual U-Value**	
External walls	*0.26*	0.13	Walls (1) (0.13)	**OK**
Party walls	*0.2*	0	Party Wall (1) (0)	**N/A**
Curtain walls	*1.6*	0	N/A	**N/A**
Floors	*0.18*	0.11	Exposed Floor (0.14)	**OK**
Roofs	*0.16*	0.11	Roof (2) (0.12)	**OK**
Windows, doors, and roof windows	*1.6*	0.76	Front (0.78)	**OK**
Rooflights	*2.2*	N/A	N/A	**N/A**

2b Envelope elements (better than typically expected values are flagged with a subsequent (!))		
Name	**Net area [m^2]**	**U-Value [W/m^2K]**
Exposed wall: Walls (1)	59.41	0.13 **(!)**
Party wall: Party Wall (1)	26.65	0 **(!)**
Ground floor: GF, GF	3.02	0.09 **(!)**
Party floor: Exposed Floor, Exposed Floor	1.61	0.14
Exposed roof: Roof (1)	45.85	0.11
Exposed roof: Roof (2)	3.02	0.12

2c Openings (better than typically expected values are flagged with a subsequent (!))				
Name	**Area [m^2]**	**Orientation**	**Frame factor**	**U-Value [W/m^2K]**
Front, Door	2.15	South	N/A	0.78 **(!)**
Front, Window	2.05	South	1.0	0.75 **(!)**
Rear, Window	2.86	North	1.0	0.75 **(!)**
Side, Window	0.82	West	1.0	0.75 **(!)**

2d Thermal bridging (better than typically expected values are flagged with a subsequent (!))				
Building part **1**: Thermal bridging calculated from linear thermal transmittances for each junction				
Main element	**Junction detail**	**Source**	**Psi value [W/mK]**	**Drawing / reference**
External wall	E2: Other lintels (including other steel lintels)	Calculated by person with suitable expertise	0.115	Thermal Bridge Report

Main element	Junction detail	Source	Psi value [W/mK]	Drawing / reference
External wall	E3: Sill	Calculated by person with suitable expertise	0.017 **(!)**	Thermal Bridge Report
External wall	E4: Jamb	Calculated by person with suitable expertise	0.094	Thermal Bridge Report
External wall	E5: Ground floor (normal)	Calculated by person with suitable expertise	0.067	Thermal Bridge Report
External wall	E7: Party floor between dwellings (in blocks of flats)	Calculated by person with suitable expertise	0.032 **(!)**	Thermal Bridge Report
External wall	E16: Corner (normal)	Calculated by person with suitable expertise	0.068	Thermal Bridge Report
External wall	E17: Corner (inverted - internal area greater than external area)	Calculated by person with suitable expertise	-0.029 **(!)**	Thermal Bridge Report
Party wall	P1: Ground floor	Calculated by person with suitable expertise	0.056	Thermal Bridge Report
External wall	E18: Party wall between dwellings	SAP table default	0.24	Thermal Bridge Report
External wall	E25: Staggered party wall between dwellings	Calculated by person with suitable expertise	0.056	Thermal Bridge Report
External wall	E20: Exposed floor (normal)	SAP table default	0.32	K1
External wall	E21: Exposed floor (inverted)	SAP table default	0.32	K1
External wall	E6: Intermediate floor within a dwelling	Calculated by person with suitable expertise	0.032 **(!)**	Thermal Bridge Report
External wall	E10: Eaves (insulation at ceiling level)	Calculated by person with suitable expertise	0.042	TRISCO
External wall	E12: Gable (insulation at ceiling level)	Calculated by person with suitable expertise	0.077	Thermal Bridge Report
External wall	E14: Flat roof	Calculated by person with suitable expertise	0.205	Thermal Bridge Report
External wall	E24: Eaves (insulation at ceiling level - inverted)	SAP table default	0.15	K1
Party wall	P4: Roof (insulation at ceiling level)	Calculated by person with suitable expertise	0.102	Thermal Bridge Report
Party wall	P5: Roof (insulation at rafter level)	SAP table default	0.48	K1

3 Air permeability (better than typically expected values are flagged with a subsequent (!))		
Maximum permitted air permeability at 50Pa	*8 m^3/hm^2*	
Dwelling air permeability at 50Pa	2.64 m^3/hm^2, Measured value **(!)**	**OK**
Air permeability test certificate reference		

4 Space heating	
Main heating system 1: Room heaters - Electricity	
Efficiency	100.0%
Emitter type	
Flow temperature	
System type	Panel, convector or radiant heaters
Manufacturer	
Model	
Commissioning	
Main heating system 2: Heat pump with radiators or underfloor heating - Electricity	
Efficiency	0.0%
Emitter type	
Flow temperature	
System type	Heat Pump
Manufacturer	Vaillant Group UK Ltd
Model	aroSTOR 200ltr
Commissioning	
Secondary heating system: N/A	
Fuel	N/A
Efficiency	N/A
Commissioning	

5 Hot water		
Cylinder/store - type: N/A		
Capacity	N/A	
Declared heat loss	N/A	
Primary pipework insulated	N/A	
Manufacturer		
Model		
Commissioning		
Waste water heat recovery system 1 - type: N/A		
Efficiency		
Manufacturer		
Model		

6 Controls		
Main heating 1 - type: Programmer and room thermostats		
Function		
Ecodesign class		
Manufacturer		
Model		
Main heating 2 - type: Not applicable		
Function		
Ecodesign class		
Manufacturer		
Model		
Water heating - type: Cylinder thermostat and HW separately timed		
Manufacturer		
Model		

7 Lighting		
Minimum permitted light source efficacy	*75 lm/W*	
Lowest light source efficacy	75 lm/W	**OK**
External lights control	N/A	

8 Mechanical ventilation		
System type: Balanced whole-house mechanical ventilation with heat recovery		
Maximum permitted specific fan power	*1.5 W/(l/s)*	
Specific fan power	0.87 W/(l/s)	**OK**
Minimum permitted heat recovery efficiency	*73%*	
Heat recovery efficiency	89%	**OK**
Manufacturer/Model	DV96 Adroit	
Commissioning		

9 Local generation
N/A

10 Heat networks
N/A

11 Supporting documentary evidence	
Documentary evidence identified in 11.1 and 11.2 is needed to confirm the data values used for any calculations undertaken, manufacturer declarations made, and tests performed as reflected in this "As built" BREL Compliance Report are correct. 11.1 SAP Conventions, Appendix 1 (documentary evidence) schedules the minimum documentary evidence required. 11.2 Indicative photographic evidence of key stages during construction (guidance within Approved Document L, Volume 1 – Appendix B) that confirms the products identified in this BREL Compliance Report are used in this dwelling, and workmanship is of sufficient quality to support the calculated values claimed in 2a to 2d.	

12 Declarations

a. Assessor Declaration

This declaration by the assessor is confirmation that the contents of this BREL Compliance Report are a true and accurate reflection based upon the design and construction information submitted for this dwelling for the purpose of carrying out the assessment, and that the supporting documentary evidence (identified in 11.1 and 11.2) pursuant to Part L of the Building Regulations 2010 (as amended) has been reviewed in the course of preparing this BREL Compliance Report.	

Signed:	Assessor ID:
Name:	Date:

b. Client Declaration

This declaration by the client is confirmation that the dwelling has been constructed and completed according to the specifications set out in this BREL Compliance Report, and that photographic evidence of key stages, as described in 11.2, has been provided to the Assessor for this dwelling.	

Signed:	Organisation:
Name:	Date:

Full SAP Calculation Printout

Property Reference	78449-20	**Issued on Date**	03/10/2025
Assessment Reference	001	**Prop Type Ref**	Top Flat / End
Property	10 Shepherd Street, MANCHESTER, M9 4QW		

SAP Rating	81 B	**DER**	5.82	**TER**	15.12
Environmental	96 A	**% DER < TER**			61.51
CO_2 Emissions (t/year)	0.27	**DFEE**	36.57	**TFEE**	40.67
Compliance Check	See BREL	**% DFEE < TFEE**			10.09
% DPER < TPER	23.79	**DPER**	60.83	**TPER**	79.82

Assessor Details	Mr. Daniel Goddard	**Assessor ID**	CP52-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	3.0200 (1b)	x	2.8500 (2b)	=	8.6070	(1b) - (3b)
First floor	45.8500 (1c)	x	2.5200 (2c)	=	115.5420	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	48.8700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	124.1490	(5)

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2. Ventilation rate

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				m3 per hour	
Number of open chimneys			0 * 80 =	0.0000	(6a)
Number of open flues			0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire			0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler			0 * 20 =	0.0000	(6d)
Number of flues attached to other heater			0 * 35 =	0.0000	(6e)
Number of blocked chimneys			0 * 20 =	0.0000	(6f)
Number of intermittent extract fans			0 * 10 =	0.0000	(7a)
Number of passive vents			0 * 10 =	0.0000	(7b)
Number of flueless gas fires			0 * 40 =	0.0000	(7c)
				Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =			0.0000 / (5) =	0.0000	(8)
Pressure test				Yes	
Pressure Test Method				Blower Door	
Measured/design AP50				2.6400	(17)
Infiltration rate				0.1320	(18)
Number of sides sheltered				2	(19)
Shelter factor			(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =	0.1122	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1431	0.1403	0.1374	0.1234	0.1206	0.1066	0.1066	0.1038	0.1122	0.1206	0.1262	0.1318	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	80.1000	(23c)

Effective ac	0.2426	0.2397	0.2369	0.2229	0.2201	0.2061	0.2061	0.2033	0.2117	0.2201	0.2257	0.2313	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door			2.1500	0.7800	1.6770			(26)
Window			5.7300	0.7282	4.1723			(27)
GF			3.0200	0.0900	0.2718	75.0000	226.5000	(28a)
Exposed Floor			1.6100	0.1400	0.2254	20.0000	32.2000	(28b)
Main	67.2921	7.8800	59.4121	0.1300	7.7236	9.0000	534.7089	(29a)
PIJ	45.8500		45.8500	0.1100	5.0435	9.0000	412.6500	(30)
Flat	3.0200		3.0200	0.1200	0.3624	9.0000	27.1800	(30)
Total net area of external elements Aum(A, m2)			120.7921					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.4760			(33)
Main dwelling								
Party Wall 1			26.6500	0.0000	0.0000	20.0000	533.0000	(32)
Party Floor 1			37.9700			30.0000	1139.1000	(32d)
Timber			50.4000			9.0000	453.6000	(32c)
Internal Floor 1			6.2700			18.0000	112.8600	(32d)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 3471.7989 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 71.0415 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	5.8000	0.1150	0.6670
E3 Sill	5.8000	0.0170	0.0986
E4 Jamb	16.2000	0.0940	1.5228
E5 Ground floor (normal)	2.0100	0.0670	0.1347
E7 Party floor between dwellings (in blocks of flats)	21.8500	0.0320	0.6992
E16 Corner (normal)	10.0800	0.0680	0.6854
E17 Corner (inverted - internal area greater than external area)	5.0400	-0.0290	-0.1462
P1 Party wall - Ground floor	5.1000	0.0560	0.2856
E18 Party wall between dwellings	11.4000	0.2400	2.7360
E25 Staggered party wall between dwellings	5.0400	0.0560	0.2822
E20 Exposed floor (normal)	1.2700	0.3200	0.4064
E21 Exposed floor (inverted)	3.8100	0.3200	1.2192
E6 Intermediate floor within a dwelling	2.5800	0.0320	0.0826
E10 Eaves (insulation at ceiling level)	15.9700	0.0420	0.6707
E12 Gable (insulation at ceiling level)	8.4600	0.0770	0.6514
E14 Flat roof	2.0100	0.2050	0.4120
E24 Eaves (insulation at ceiling level - inverted)	2.0100	0.1500	0.3015
P4 Party wall - Roof (insulation at ceiling level)	4.9100	0.1020	0.5008
P5 Party wall - Roof (insulation at rafter level)	3.0000	0.4800	1.4400

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 12.6501 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 32.1261 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	9.9373	9.8224	9.7074	9.1328	9.0179	8.4433	8.4433	8.3284	8.6732	9.0179	9.2478	9.4776	(38)
Heat transfer coeff	42.0634	41.9484	41.8335	41.2589	41.1440	40.5694	40.5694	40.4545	40.7993	41.1440	41.3738	41.6037	(39)

Average = Sum(39)m / 12 = 41.2302

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8607	0.8584	0.8560	0.8443	0.8419	0.8301	0.8301	0.8278	0.8349	0.8419	0.8466	0.8513	(40)
HLP (average)												0.8437	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.6569 (42)
Hot water usage for mixer showers

52.0000	51.2186	50.0798	47.9010	46.2932	44.5001	43.4809	44.6110	45.8498	47.7751	50.0006	51.8008	(42a)

Hot water usage for baths

22.4849	22.1510	21.6808	20.8137	20.1645	19.4446	19.0557	19.5227	20.0311	20.8014	21.6863	22.4089	(42b)

Hot water usage for other uses

31.5982	30.4492	29.3001	28.1511	27.0021	25.8531	25.8531	27.0021	28.1511	29.3001	30.4492	31.5982	(42c)

Average daily hot water use (litres/day) 97.5150 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	106.0831	103.8187	101.0607	96.8659	93.4597	89.7977	88.3896	91.1358	94.0320	97.8766	102.1361	105.8079	(44)
Energy conte	168.0098	147.8365	155.3265	132.6045	125.8147	110.4167	106.8996	112.8451	115.9509	132.8176	145.5116	165.6696	(45)
Energy content (annual)										Total = Sum(45)m =		1619.7032	
Distribution loss (46)m = 0.15 x (45)m	25.2015	22.1755	23.2990	19.8907	18.8722	16.5625	16.0349	16.9268	17.3926	19.9226	21.8267	24.8504	(46)
Water storage loss:													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8694	(55)
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	194.9612	172.1797	182.2779	158.6865	152.7661	136.4987	133.8510	139.7965	142.0329	159.7690	171.5936	192.6210	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	194.9612	172.1797	182.2779	158.6865	152.7661	136.4987	133.8510	139.7965	142.0329	159.7690	171.5936	192.6210	(64)
										Total per year (kWh/year) = Sum(64)m =		1937.0342	(64)
12Total per year (kWh/year)												1937	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	55.8632	49.1556	51.6461	44.0910	41.8334	36.7136	35.5441	37.5210	38.5537	44.1619	48.3826	55.0851	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	83.5900	92.5461	83.5900	86.3763	83.5900	86.3763	83.5900	83.5900	86.3763	83.5900	86.3763	83.5900	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	144.2994	145.7968	142.0235	133.9905	123.8503	114.3199	107.9530	106.4556	110.2290	118.2620	128.4022	137.9326	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	(71)
Water heating gains (Table 5)	75.0850	73.1483	69.4168	61.2375	56.2277	50.9911	47.7744	50.4314	53.5468	59.3573	67.1981	74.0392	(72)
Total internal gains	350.8277	359.3444	342.8835	329.4576	311.5213	299.5406	287.1707	288.3304	298.0054	309.0626	329.8299	343.4150	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	2.8600	10.6334	0.3800	0.0000	0.7700	8.8984	(74)
South	2.0500	46.7521	0.3800	0.0000	0.7700	28.0433	(78)
West	0.8200	19.6403	0.3800	0.0000	0.7700	4.7123	(80)

Solar gains	41.6540	72.1513	102.5811	134.6775	158.5625	161.0216	153.7257	135.2141	113.5130	80.7182	50.0939	35.5253	(83)
Total gains	392.4818	431.4958	445.4647	464.1351	470.0837	460.5622	440.8964	423.5445	411.5184	389.7808	379.9238	378.9404	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	22.9270	22.9899	23.0530	23.3741	23.4393	23.7713	23.7713	23.8388	23.6374	23.4393	23.3091	23.1804	
alpha	2.5285	2.5327	2.5369	2.5583	2.5626	2.5848	2.5848	2.5893	2.5758	2.5626	2.5539	2.5454	
util living area	0.8838	0.8539	0.8173	0.7446	0.6420	0.4996	0.3806	0.4085	0.5747	0.7520	0.8473	0.8912	(86)
MIT	18.9551	19.2329	19.6023	20.1096	20.5309	20.8276	20.9377	20.9235	20.7378	20.2178	19.5340	18.9132	(87)
Th 2	20.2010	20.2030	20.2050	20.2151	20.2172	20.2273	20.2273	20.2293	20.2232	20.2172	20.2131	20.2091	(88)
util rest of house	0.8733	0.8411	0.8008	0.7211	0.6077	0.4514	0.3205	0.3481	0.5278	0.7247	0.8320	0.8813	(89)
MIT 2	17.7947	18.1417	18.6031	19.2320	19.7349	20.0744	20.1834	20.1733	19.9795	19.3741	18.5307	17.7476	(90)
Living area fraction										fLA = Living area / (4) =		0.3912	(91)
MIT	18.2487	18.5686	18.9940	19.5753	20.0464	20.3691	20.4785	20.4668	20.2762	19.7042	18.9232	18.2036	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.2487	18.5686	18.9940	19.5753	20.0464	20.3691	20.4785	20.4668	20.2762	19.7042	18.9232	18.2036	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8420	0.8099	0.7720	0.6999	0.5997	0.4605	0.3405	0.3672	0.5312	0.7049	0.8024	0.8505	(94)
Useful gains	330.4567	349.4810	343.8769	324.8445	281.9323	212.1001	150.1119	155.5234	218.5885	274.7413	304.8530	322.2875	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	586.7290	573.3759	522.6701	440.4520	343.4032	234.0487	157.3476	164.5214	251.9842	374.5833	489.1722	582.6019	(97)
Space heating kWh	190.6666	150.4574	133.0222	83.2374	45.7343	0.0000	0.0000	0.0000	0.0000	74.2824	132.7098	193.6739	(98a)
Space heating requirement - total per year (kWh/year)												1003.7841	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	190.6666	150.4574	133.0222	83.2374	45.7343	0.0000	0.0000	0.0000	0.0000	74.2824	132.7098	193.6739	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1003.7841	
Space heating per m2											(98c) / (4) =	20.5399	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	190.6666	150.4574	133.0222	83.2374	45.7343	0.0000	0.0000	0.0000	0.0000	74.2824	132.7098	193.6739	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	190.6666	150.4574	133.0222	83.2374	45.7343	0.0000	0.0000	0.0000	0.0000	74.2824	132.7098	193.6739	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	194.9612	172.1797	182.2779	158.6865	152.7661	136.4987	133.8510	139.7965	142.0329	159.7690	171.5936	192.6210	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month	60.0768	53.0567	56.1685	48.8988	47.0745	42.0617	41.2458	43.0779	43.7671	49.2324	52.8761	59.3557	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	15.6682	14.1519	15.6682	15.1628	15.6682	15.1628	15.6682	15.6682	15.1628	15.6682	15.1628	15.6682	(231)
Lighting	16.7415	13.4307	12.0928	8.8597	6.8435	5.5912	6.2429	8.1147	10.5402	13.8293	15.6202	17.2068	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													

(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1003.7841	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	324.5200	
Water heating fuel used	596.8921	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.2180)		
mechanical ventilation fans (SFP = 1.2180)	184.4804	(230a)
Total electricity for the above, kWh/year	184.4804	(231)
Electricity for lighting (calculated in Appendix L)	135.1135	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	1920.2701	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1003.7841	0.1546	155.1546	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	596.8921	0.1411	84.2266	(264)
Space and water heating			239.3812	(265)
Pumps, fans and electric keep-hot	184.4804	0.1387	25.5897	(267)
Energy for lighting	135.1135	0.1443	19.5011	(268)
Total CO2, kg/year			284.4719	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			5.8200	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1003.7841	1.5723	1578.2011	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	596.8921	1.5218	908.3378	(278)
Space and water heating			2486.5389	(279)
Pumps, fans and electric keep-hot	184.4804	1.5128	279.0820	(281)
Energy for lighting	135.1135	1.5338	207.2416	(282)
Total Primary energy kWh/year			2972.8625	(286)
Dwelling Primary energy Rate (DPER)			60.8300	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	3.0200 (1b)	x	2.8500 (2b)	=	8.6070	(1b) - (3b)
First floor	45.8500 (1c)	x	2.5200 (2c)	=	115.5420	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	48.8700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	124.1490	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1611	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)

Infiltration rate	0.4111	(18)
Number of sides sheltered	2	(19)
Shelter factor (20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) =	0.3494	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4455	0.4368	0.4281	0.3844	0.3756	0.3320	0.3320	0.3232	0.3494	0.3756	0.3931	0.4106	(22b)
Effective ac	0.5992	0.5954	0.5916	0.5739	0.5706	0.5551	0.5551	0.5522	0.5611	0.5706	0.5773	0.5843	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			2.1500	1.0000	2.1500			(26)
TER Opening Type			5.7300	1.1450	6.5611			(27)
GF			3.0200	0.1300	0.3926			(28a)
Exposed Floor			1.6100	0.1300	0.2093			(28b)
Main	67.2921	7.8800	59.4121	0.1800	10.6942			(29a)
PIJ	45.8500		45.8500	0.1100	5.0435			(30)
Flat	3.0200		3.0200	0.1100	0.3322			(30)
Total net area of external elements Aum(A, m2)			120.7921					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		25.3828			(33)
Main dwelling								
Party Wall 1			26.6500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	71.0415	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	5.8000	0.0500	0.2900
E3 Sill	5.8000	0.0500	0.2900
E4 Jamb	16.2000	0.0500	0.8100
E5 Ground floor (normal)	2.0100	0.1600	0.3216
E7 Party floor between dwellings (in blocks of flats)	21.8500	0.0700	1.5295
E16 Corner (normal)	10.0800	0.0900	0.9072
E17 Corner (inverted - internal area greater than external area)	5.0400	-0.0900	-0.4536
P1 Party wall - Ground floor	5.1000	0.0800	0.4080
E18 Party wall between dwellings	11.4000	0.0600	0.6840
E25 Staggered party wall between dwellings	5.0400	0.0600	0.3024
E20 Exposed floor (normal)	1.2700	0.3200	0.4064
E21 Exposed floor (inverted)	3.8100	0.3200	1.2192
E6 Intermediate floor within a dwelling	2.5800	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	15.9700	0.0600	0.9582
E12 Gable (insulation at ceiling level)	8.4600	0.0600	0.5076
E14 Flat roof	2.0100	0.0800	0.1608
E24 Eaves (insulation at ceiling level - inverted)	2.0100	0.2400	0.4824
P4 Party wall - Roof (insulation at ceiling level)	4.9100	0.1200	0.5892
P5 Party wall - Roof (insulation at rafter level)	3.0000	0.0800	0.2400

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	9.6529	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	35.0357	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	24.5506	24.3928	24.2380	23.5111	23.3751	22.7419	22.7419	22.6247	22.9858	23.3751	23.6502	23.9378	(38)
Heat transfer coeff	59.5864	59.4285	59.2737	58.5468	58.4108	57.7777	57.7777	57.6604	58.0216	58.4108	58.6859	58.9736	(39)
Average = Sum(39)m / 12 =												58.5462	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2193	1.2161	1.2129	1.1980	1.1952	1.1823	1.1823	1.1799	1.1873	1.1952	1.2009	1.2067	(40)
HLP (average)												1.1980	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.6569	(42)

Hot water usage for mixer showers

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	52.0000	51.2186	50.0798	47.9010	46.2932	44.5001	43.4809	44.6110	45.8498	47.7751	50.0006	51.8008	(42a)

Hot water usage for baths

	22.4849	22.1510	21.6808	20.8137	20.1645	19.4446	19.0557	19.5227	20.0311	20.8014	21.6863	22.4089	(42b)

Hot water usage for other uses

	31.5982	30.4492	29.3001	28.1511	27.0021	25.8531	25.8531	27.0021	28.1511	29.3001	30.4492	31.5982	(42c)

Average daily hot water use (litres/day)	97.5150 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	106.0831	103.8187	101.0607	96.8659	93.4597	89.7977	88.3896	91.1358	94.0320	97.8766	102.1361	105.8079	(44)
Energy conte	168.0098	147.8365	155.3265	132.6045	125.8147	110.4167	106.8996	112.8451	115.9509	132.8176	145.5116	165.6696	(45)
Energy content (annual)										Total = Sum(45)m =		1619.7032	

Distribution loss (46)m = 0.15 x (45)m

	25.2015	22.1755	23.2990	19.8907	18.8722	16.5625	16.0349	16.9268	17.3926	19.9226	21.8267	24.8504	(46)

Water storage loss:	
Store volume	150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):	1.3938 (48)
Temperature factor from Table 2b	0.5400 (49)
Enter (49) or (54) in (55)	0.7527 (55)

Total storage loss

	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)

If cylinder contains dedicated solar storage

	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

	214.6047	189.9222	201.9214	177.6964	172.4096	155.5086	153.4945	159.4400	161.0427	179.4125	190.6035	212.2645	(62)
WWHRS	-23.7722	-21.0244	-22.0155	-18.2297	-16.9894	-14.5380	-13.6270	-14.4910	-15.0415	-17.7323	-20.0886	-23.3320	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

	190.8324	168.8978	179.9059	159.4667	155.4202	140.9706	139.8675	144.9490	146.0012	161.6802	170.5149	188.9325 (64)
Total per year (kWh/year) = Sum(64)m =												1947.4390 (64)
12Total per year (kWh/year)												1947 (64)
Electric shower(s)												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000 (64a)
Heat gains from water heating, kWh/month												
	93.1392	82.8242	88.9220	80.1645	79.1093	72.7870	72.8200	74.7969	74.6271	81.4378	84.4561	92.3611 (65)

5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	81.2011	89.9012	81.2011	83.9078	81.2011	83.9078	81.2011	81.2011	83.9078	81.2011	83.9078	81.2011	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	144.2994	145.7968	142.0235	133.9905	123.8503	114.3199	107.9530	106.4556	110.2290	118.2620	128.4022	137.9326	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	(71)
Water heating gains (Table 5)													
	125.1871	123.2503	119.5188	111.3395	106.3297	101.0931	97.8764	100.5335	103.6488	109.4594	117.3001	124.1412	(72)
Total internal gains													
	401.5409	409.8016	393.5967	380.0911	362.2344	347.1741	334.8838	336.0435	345.6389	359.7758	380.4634	394.1282	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	2.8600	10.6334	0.6300	0.7000	0.7700	9.2941	(74)
South	2.0500	46.7521	0.6300	0.7000	0.7700	29.2905	(78)
West	0.8200	19.6403	0.6300	0.7000	0.7700	4.9219	(80)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	43.5065	75.3601	107.1433	140.6671	165.6143	168.1828	160.5625	141.2276	118.5614	84.3081	52.3218	37.1053	(83)
Total gains	445.0474	485.1618	500.7400	520.7582	527.8487	515.3569	495.4463	477.2711	464.2003	444.0838	432.7852	431.2334	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	16.1847	16.2277	16.2701	16.4721	16.5104	16.6914	16.6914	16.7253	16.6212	16.5104	16.4330	16.3529	
alpha	2.0790	2.0818	2.0847	2.0981	2.1007	2.1128	2.1128	2.1150	2.1081	2.1007	2.0955	2.0902	
util living area													
	0.8867	0.8632	0.8331	0.7740	0.6872	0.5615	0.4434	0.4709	0.6269	0.7759	0.8553	0.8925	(86)
MIT	18.0516	18.3549	18.8226	19.4876	20.1049	20.5991	20.8277	20.7978	20.4560	19.6963	18.7955	18.0098	(87)
Th 2	19.9046	19.9072	19.9097	19.9216	19.9238	19.9342	19.9342	19.9361	19.9302	19.9238	19.9193	19.9146	(88)
util rest of house													
	0.8743	0.8484	0.8141	0.7464	0.6451	0.4964	0.3547	0.3836	0.5667	0.7436	0.8373	0.8807	(89)
MIT 2	16.5191	16.8959	17.4784	18.2996	19.0385	19.6007	19.8266	19.8036	19.4523	18.5667	17.4573	16.4706	(90)
Living area fraction									fLA = Living area / (4) =			0.3912	(91)
MIT	17.1187	17.4667	18.0043	18.7644	19.4557	19.9913	20.2183	20.1926	19.8450	19.0086	17.9809	17.0728	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.1187	17.4667	18.0043	18.7644	19.4557	19.9913	20.2183	20.1926	19.8450	19.0086	17.9809	17.0728	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8325	0.8059	0.7728	0.7115	0.6245	0.5001	0.3797	0.4060	0.5614	0.7109	0.7963	0.8396	(94)
Useful gains	370.4933	390.9897	386.9657	370.5384	329.6269	257.7521	188.1079	193.7498	260.5952	315.7120	344.6092	362.0700	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	763.8196	746.8206	681.9015	577.5299	453.0180	311.4968	209.0571	218.6804	333.3343	491.1537	638.5562	759.1545	(97)
Space heating kWh													
	292.6348	239.1184	219.4322	149.0339	91.8029	0.0000	0.0000	0.0000	0.0000	130.5286	211.6418	295.4309	(98a)
Space heating requirement - total per year (kWh/year)												1629.6235	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	292.6348	239.1184	219.4322	149.0339	91.8029	0.0000	0.0000	0.0000	0.0000	130.5286	211.6418	295.4309	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1629.6235	
Space heating per m2											(98c) / (4) =	33.3461	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	292.6348	239.1184	219.4322	149.0339	91.8029	0.0000	0.0000	0.0000	0.0000	130.5286	211.6418	295.4309	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													

	317.0474	259.0665	237.7380	161.4668	99.4615	0.0000	0.0000	0.0000	0.0000	141.4178	229.2977	320.0768 (211)
Space heating efficiency (main heating system 2)												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement												
	190.8324	168.8978	179.9059	159.4667	155.4202	140.9706	139.8675	144.9490	146.0012	161.6802	170.5149	188.9325 (64)
Efficiency of water heater												79.8000 (216)
(217)m	85.0154	84.8392	84.5063	83.9083	82.9208	79.8000	79.8000	79.8000	79.8000	83.5841	84.5455	85.0581 (217)
Fuel for water heating, kWh/month												
	224.4681	199.0799	212.8906	190.0487	187.4322	176.6549	175.2725	181.6404	182.9589	193.4341	201.6842	222.1216 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	16.8720	13.5353	12.1871	8.9288	6.8968	5.6348	6.2915	8.1780	10.6224	13.9371	15.7419	17.3409 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-23.3618	-33.1899	-48.0847	-54.5349	-59.2499	-55.5210	-54.9018	-51.6559	-45.9280	-38.2405	-25.7999	-20.1733 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-12.4159	-26.2127	-52.2550	-78.6854	-104.2042	-104.7074	-103.4098	-87.4228	-63.9461	-37.4757	-16.5791	-9.8055 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year	
Space heating fuel - main system 1	1765.5726 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	79.8000
Water heating fuel used	2347.6863 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
Total electricity for the above, kWh/year	86.0000 (231)
Electricity for lighting (calculated in Appendix L)	136.1665 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-1207.7611 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	3127.6643 (238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1765.5726	0.2100	370.7702	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2347.6863	0.2100	493.0141	(264)
Space and water heating			863.7844	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	136.1665	0.1443	19.6530	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-510.6416	0.1344	-68.6248	
PV Unit electricity exported	-697.1195	0.1258	-87.7220	
Total			-156.3468	(269)
Total CO2, kg/year			739.0198	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			15.1200	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1765.5726	1.1300	1995.0970	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2347.6863	1.1300	2652.8855	(278)
Space and water heating			4647.9825	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	136.1665	1.5338	208.8568	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-510.6416	1.4967	-764.2616	
PV Unit electricity exported	-697.1195	0.4619	-321.9990	
Total			-1086.2606	(283)
Total Primary energy kWh/year			3900.6795	(286)
Target Primary Energy Rate (TPER)			79.8200	(287)

Full SAP Calculation Printout

Property Reference	78449-20	**Issued on Date**	03/10/2025
Assessment Reference	001	**Prop Type Ref**	Top Flat / End
Property	10 Shepherd Street, MANCHESTER, M9 4QW		

SAP Rating	81 B	**DER**	5.82	**TER**	15.12
Environmental	96 A	**% DER < TER**			61.51
CO_2 Emissions (t/year)	0.27	**DFEE**	36.57	**TFEE**	40.67
Compliance Check	See BREL	**% DFEE < TFEE**			10.09
% DPER < TPER	23.79	**DPER**	60.83	**TPER**	79.82

Assessor Details	Mr. Daniel Goddard	**Assessor ID**	CP52-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

---

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	3.0200 (1b)	x	2.8500 (2b)	=	8.6070	(1b) - (3b)
First floor	45.8500 (1c)	x	2.5200 (2c)	=	115.5420	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	48.8700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	124.1490	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1611	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.6400	(17)
Infiltration rate		0.2931	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2491	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3176	0.3114	0.3052	0.2740	0.2678	0.2367	0.2367	0.2304	0.2491	0.2678	0.2803	0.2927	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5504	0.5485	0.5466	0.5376	0.5359	0.5280	0.5280	0.5266	0.5310	0.5359	0.5393	0.5428	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door			2.1500	0.7800	1.6770			(26)
Window			5.7300	0.7282	4.1723			(27)
GF			3.0200	0.0900	0.2718	75.0000	226.5000	(28a)
Exposed Floor			1.6100	0.1400	0.2254	20.0000	32.2000	(28b)
Main	67.2921	7.8800	59.4121	0.1300	7.7236	9.0000	534.7089	(29a)
PIJ	45.8500		45.8500	0.1100	5.0435	9.0000	412.6500	(30)
Flat	3.0200		3.0200	0.1200	0.3624	9.0000	27.1800	(30)
Total net area of external elements Aum(A, m2)			120.7921					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.4760			(33)
Main dwelling								
Party Wall 1			26.6500	0.0000	0.0000	20.0000	533.0000	(32)
Party Floor 1			37.9700			30.0000	1139.1000	(32d)
Timber			50.4000			9.0000	453.6000	(32c)
Internal Floor 1			6.2700			18.0000	112.8600	(32d)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		3471.7989	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							71.0415	(35)

List of Thermal Bridges

	K1 Element	Length	Psi-value	Total
E2	Other lintels (including other steel lintels)	5.8000	0.1150	0.6670
E3	Sill	5.8000	0.0170	0.0986
E4	Jamb	16.2000	0.0940	1.5228
E5	Ground floor (normal)	2.0100	0.0670	0.1347
E7	Party floor between dwellings (in blocks of flats)	21.8500	0.0320	0.6992
E16	Corner (normal)	10.0800	0.0680	0.6854
E17	Corner (inverted - internal area greater than external area)	5.0400	-0.0290	-0.1462
P1	Party wall - Ground floor	5.1000	0.0560	0.2856
E18	Party wall between dwellings	11.4000	0.2400	2.7360
E25	Staggered party wall between dwellings	5.0400	0.0560	0.2822
E20	Exposed floor (normal)	1.2700	0.3200	0.4064
E21	Exposed floor (inverted)	3.8100	0.3200	1.2192
E6	Intermediate floor within a dwelling	2.5800	0.0320	0.0826
E10	Eaves (insulation at ceiling level)	15.9700	0.0420	0.6707
E12	Gable (insulation at ceiling level)	8.4600	0.0770	0.6514
E14	Flat roof	2.0100	0.2050	0.4120
E24	Eaves (insulation at ceiling level - inverted)	2.0100	0.1500	0.3015
P4	Party wall - Roof (insulation at ceiling level)	4.9100	0.1020	0.5008
P5	Party wall - Roof (insulation at rafter level)	3.0000	0.4800	1.4400

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 12.6501 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 32.1261 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	22.5514	22.4712	22.3925	22.0230	21.9539	21.6320	21.6320	21.5724	21.7560	21.9539	22.0937	22.2399	(38)
Heat transfer coeff	54.6775	54.5973	54.5186	54.1491	54.0799	53.7581	53.7581	53.6985	53.8821	54.0799	54.2198	54.3660	(39)

Average = Sum(39)m / 12 = 54.1487

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1188	1.1172	1.1156	1.1080	1.1066	1.1000	1.1000	1.0988	1.1026	1.1066	1.1095	1.1125	(40)
HLP (average)												1.1080	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.6569 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

22.4849	22.1510	21.6808	20.8137	20.1645	19.4446	19.0557	19.5227	20.0311	20.8014	21.6863	22.4089	(42b)

Hot water usage for other uses

31.5982	30.4492	29.3001	28.1511	27.0021	25.8531	25.8531	27.0021	28.1511	29.3001	30.4492	31.5982	(42c)

Average daily hot water use (litres/day) 49.5727 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	54.0831	52.6002	50.9809	48.9648	47.1665	45.2976	44.9088	46.5247	48.1822	50.1015	52.1355	54.0071	(44)
Energy conte	85.6544	74.9019	78.3557	67.0304	63.4952	55.6987	54.3133	57.6074	59.4135	67.9873	74.2766	84.5621	(45)

Energy content (annual) Total = Sum(45)m = 823.2965

Distribution loss (46)m = 0.15 x (45)m												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:												
Total storage loss												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month												
72.8063	63.6666	66.6024	56.9758	53.9710	47.3439	46.1663	48.9663	50.5015	57.7892	63.1351	71.8778	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h												
72.8063	63.6666	66.6024	56.9758	53.9710	47.3439	46.1663	48.9663	50.5015	57.7892	63.1351	71.8778	(64)

Total per year (kWh/year) = Sum(64)m = 699.8020 (64)
12Total per year (kWh/year) 700 (64)

Electric shower(s)												
41.6433	37.1046	40.5168	38.6647	39.3902	37.5744	38.8269	39.3902	38.6647	40.5168	39.7549	41.6433	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 473.6907 (64a)

Heat gains from water heating, kWh/month												
28.6124	25.1928	26.7798	23.9101	23.3403	21.2296	21.2483	22.0891	22.2915	24.5765	25.7225	28.3803	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
83.5900	92.5461	83.5900	86.3763	83.5900	86.3763	83.5900	83.5900	86.3763	83.5900	86.3763	83.5900	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
144.2994	145.7968	142.0235	133.9905	123.8503	114.3199	107.9530	106.4556	110.2290	118.2620	128.4022	137.9326	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	(71)
Water heating gains (Table 5)													
38.4575	37.4893	35.9943	33.2085	31.3713	29.4855	28.5595	29.6897	30.9605	33.0329	35.7257	38.1455	(72)
Total internal gains													
314.2003	323.6855	309.4611	301.4286	286.6649	278.0351	267.9559	267.5886	275.4191	282.7382	298.3575	307.5214	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a	g Specific data	FF Specific data	Access factor	Gains W

		W/m2	or Table 6b	or Table 6c	Table 6d		
North	2.8600	10.6334	0.3800	0.0000	0.7700	8.8984	(74)
South	2.0500	46.7521	0.3800	0.0000	0.7700	28.0433	(78)
West	0.8200	19.6403	0.3800	0.0000	0.7700	4.7123	(80)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	41.6540	72.1513	102.5811	134.6775	158.5625	161.0216	153.7257	135.2141	113.5130	80.7182	50.0939	35.5253	(83)
Total gains	355.8543	395.8368	412.0423	436.1061	445.2274	439.0566	421.6816	402.8027	388.9321	363.4564	348.4514	343.0467	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	17.6378	17.6637	17.6892	17.8099	17.8326	17.9394	17.9394	17.9593	17.8981	17.8326	17.7866	17.7388	
alpha	2.1759	2.1776	2.1793	2.1873	2.1888	2.1960	2.1960	2.1973	2.1932	2.1888	2.1858	2.1826	
util living area	0.9173	0.8949	0.8676	0.8111	0.7271	0.6002	0.4788	0.5108	0.6712	0.8190	0.8911	0.9229	(86)
MIT	17.9962	18.3114	18.7798	19.4494	20.0777	20.5844	20.8212	20.7869	20.4291	19.6373	18.7220	17.9364	(87)
Th 2	19.9855	19.9868	19.9881	19.9943	19.9954	20.0008	20.0008	20.0018	19.9987	19.9954	19.9931	19.9907	(88)
util rest of house	0.9081	0.8833	0.8521	0.7874	0.6890	0.5381	0.3915	0.4251	0.6153	0.7917	0.8771	0.9143	(89)
MIT 2	17.2489	17.5580	18.0181	18.6705	19.2654	19.7217	19.9092	19.8873	19.5938	18.8613	17.9708	17.1936	(90)
Living area fraction										fLA = Living area / (4) =		0.3912	(91)
MIT	17.5413	17.8528	18.3161	18.9752	19.5832	20.0592	20.2660	20.2392	19.9206	19.1649	18.2647	17.4842	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.5413	17.8528	18.3161	18.9752	19.5832	20.0592	20.2660	20.2392	19.9206	19.1649	18.2647	17.4842	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8789	0.8522	0.8206	0.7590	0.6714	0.5420	0.4160	0.4468	0.6104	0.7648	0.8467	0.8859	(94)
Useful gains	312.7565	337.3265	338.1133	331.0239	298.9221	237.9863	175.4200	179.9856	237.4156	277.9761	295.0385	303.9160	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	724.0012	707.1848	644.1984	545.5653	426.3219	293.4789	197.0783	206.1619	313.6281	463.1908	605.3474	722.2105	(97)
Space heating kWh	305.9660	248.5448	227.7274	154.4698	94.7854	0.0000	0.0000	0.0000	0.0000	137.7997	223.4224	311.2111	(98a)
Space heating requirement - total per year (kWh/year)												1703.9266	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	305.9660	248.5448	227.7274	154.4698	94.7854	0.0000	0.0000	0.0000	0.0000	137.7997	223.4224	311.2111	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1703.9266	
Space heating per m2											(98c) / (4) =	34.8665	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	505.3263	397.8101	408.1088	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.6659	0.7333	0.7101	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	336.4808	291.7071	289.8041	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	475.3690	457.0016	436.6295	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	99.9995	122.9791	109.2381	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	24.9999	30.7448	27.3095	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												83.0542	(107)
Energy for space heating												34.8665	(99)
Energy for space cooling												1.6995	(108)
Total												36.5660	(109)
Fabric Energy Efficiency (DFEE)												36.6	(109)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	3.0200	(1b) x	2.8500	(2b) =	8.6070	(1b) - (3b)
First floor	45.8500	(1c) x	2.5200	(2c) =	115.5420	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	48.8700					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	124.1490	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1611	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4111	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3494	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4455	0.4368	0.4281	0.3844	0.3756	0.3320	0.3320	0.3232	0.3494	0.3756	0.3931	0.4106	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5992	0.5954	0.5916	0.5739	0.5706	0.5551	0.5551	0.5522	0.5611	0.5706	0.5773	0.5843	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			2.1500	1.0000	2.1500			(26)
TER Opening Type			5.7300	1.1450	6.5611			(27)
GF			3.0200	0.1300	0.3926			(28a)
Exposed Floor			1.6100	0.1300	0.2093			(28b)
Main	67.2921	7.8800	59.4121	0.1800	10.6942			(29a)
PIJ	45.8500		45.8500	0.1100	5.0435			(30)
Flat	3.0200		3.0200	0.1100	0.3322			(30)
Total net area of external elements Aum(A, m2)			120.7921					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		25.3828			(33)
Main dwelling								
Party Wall 1			26.6500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	71.0415	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	5.8000	0.0500	0.2900
E3 Sill	5.8000	0.0500	0.2900
E4 Jamb	16.2000	0.0500	0.8100
E5 Ground floor (normal)	2.0100	0.1600	0.3216
E7 Party floor between dwellings (in blocks of flats)	21.8500	0.0700	1.5295
E16 Corner (normal)	10.0800	0.0900	0.9072
E17 Corner (inverted - internal area greater than external area)	5.0400	-0.0900	-0.4536
P1 Party wall - Ground floor	5.1000	0.0800	0.4080
E18 Party wall between dwellings	11.4000	0.0600	0.6840
E25 Staggered party wall between dwellings	5.0400	0.0600	0.3024
E20 Exposed floor (normal)	1.2700	0.3200	0.4064
E21 Exposed floor (inverted)	3.8100	0.3200	1.2192
E6 Intermediate floor within a dwelling	2.5800	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	15.9700	0.0600	0.9582
E12 Gable (insulation at ceiling level)	8.4600	0.0600	0.5076
E14 Flat roof	2.0100	0.0800	0.1608
E24 Eaves (insulation at ceiling level - inverted)	2.0100	0.2400	0.4824
P4 Party wall - Roof (insulation at ceiling level)	4.9100	0.1200	0.5892
P5 Party wall - Roof (insulation at rafter level)	3.0000	0.0800	0.2400

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		9.6529	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	35.0357	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	24.5506	24.3928	24.2380	23.5111	23.3751	22.7419	22.7419	22.6247	22.9858	23.3751	23.6502	23.9378	(38)
Heat transfer coeff	59.5864	59.4285	59.2737	58.5468	58.4108	57.7777	57.7777	57.6604	58.0216	58.4108	58.6859	58.9736	(39)
Average = Sum(39)m / 12 =												58.5462	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2193	1.2161	1.2129	1.1980	1.1952	1.1823	1.1823	1.1799	1.1873	1.1952	1.2009	1.2067	(40)
HLP (average)												1.1980	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.6569	(42)

Hot water usage for mixer showers

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

	22.4849	22.1510	21.6808	20.8137	20.1645	19.4446	19.0557	19.5227	20.0311	20.8014	21.6863	22.4089	(42b)

Hot water usage for other uses

	31.5982	30.4492	29.3001	28.1511	27.0021	25.8531	25.8531	27.0021	28.1511	29.3001	30.4492	31.5982	(42c)
Average daily hot water use (litres/day)												49.5727	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	54.0831	52.6002	50.9809	48.9648	47.1665	45.2976	44.9088	46.5247	48.1822	50.1015	52.1355	54.0071	(44)
Energy conte	85.6544	74.9019	78.3557	67.0304	63.4952	55.6987	54.3133	57.6074	59.4135	67.9873	74.2766	84.5621	(45)
Energy content (annual)										Total = Sum(45)m =		823.2965	
Distribution loss (46)m = 0.15 x (45)m													

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	72.8063	63.6666	66.6024	56.9758	53.9710	47.3439	46.1663	48.9663	50.5015	57.7892	63.1351	71.8778	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	72.8063	63.6666	66.6024	56.9758	53.9710	47.3439	46.1663	48.9663	50.5015	57.7892	63.1351	71.8778	(64)
									Total per year (kWh/year) = Sum(64)m =			699.8020	(64)
12Total per year (kWh/year)												700	(64)
Electric shower(s)													
	41.6433	37.1046	40.5168	38.6647	39.3902	37.5744	38.8269	39.3902	38.6647	40.5168	39.7549	41.6433	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			473.6907	(64a)
Heat gains from water heating, kWh/month													
	28.6124	25.1928	26.7798	23.9101	23.3403	21.2296	21.2483	22.0891	22.2915	24.5765	25.7225	28.3803	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	81.2011	89.9012	81.2011	83.9078	81.2011	83.9078	81.2011	81.2011	83.9078	81.2011	83.9078	81.2011	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	144.2994	145.7968	142.0235	133.9905	123.8503	114.3199	107.9530	106.4556	110.2290	118.2620	128.4022	137.9326	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	(71)
Water heating gains (Table 5)													
	38.4575	37.4893	35.9943	33.2085	31.3713	29.4855	28.5595	29.6897	30.9605	33.0329	35.7257	38.1455	(72)
Total internal gains													
	311.8114	321.0406	307.0722	298.9601	284.2760	275.5665	265.5669	265.1997	272.9505	280.3493	295.8890	305.1325	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	2.8600	10.6334	0.6300	0.7000	0.7700	9.2941	(74)
South	2.0500	46.7521	0.6300	0.7000	0.7700	29.2905	(78)
West	0.8200	19.6403	0.6300	0.7000	0.7700	4.9219	(80)

Solar gains	43.5065	75.3601	107.1433	140.6671	165.6143	168.1828	160.5625	141.2276	118.5614	84.3081	52.3218	37.1053	(83)
Total gains	355.3179	396.4007	414.2155	439.6272	449.8903	443.7493	426.1294	406.4273	391.5119	364.6573	348.2107	342.2377	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	16.1847	16.2277	16.2701	16.4721	16.5104	16.6914	16.6914	16.7253	16.6212	16.5104	16.4330	16.3529	
alpha	2.0790	2.0818	2.0847	2.0981	2.1007	2.1128	2.1128	2.1150	2.1081	2.1007	2.0955	2.0902	
util living area													
	0.9211	0.8998	0.8736	0.8194	0.7388	0.6151	0.4955	0.5276	0.6858	0.8278	0.8963	0.9263	(86)
MIT	17.7209	18.0495	18.5502	19.2753	19.9544	20.5174	20.7853	20.7464	20.3440	19.4845	18.5083	17.6747	(87)
Th 2	19.9046	19.9072	19.9097	19.9216	19.9238	19.9342	19.9342	19.9361	19.9302	19.9238	19.9193	19.9146	(88)
util rest of house													
	0.9118	0.8881	0.8579	0.7952	0.6994	0.5498	0.4015	0.4359	0.6275	0.8001	0.8822	0.9176	(89)
MIT 2	16.9298	17.2531	17.7461	18.4569	19.1021	19.6139	19.8268	19.8027	19.4696	18.6700	17.7172	16.8906	(90)
Living area fraction										fLA = Living area / (4) =		0.3912	(91)
MIT	17.2393	17.5647	18.0607	18.7771	19.4356	19.9674	20.2018	20.1719	19.8117	18.9887	18.0267	17.1974	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.2393	17.5647	18.0607	18.7771	19.4356	19.9674	20.2018	20.1719	19.8117	18.9887	18.0267	17.1974	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8814	0.8554	0.8243	0.7643	0.6790	0.5520	0.4268	0.4578	0.6203	0.7708	0.8503	0.8881	(94)
Useful gains	313.1660	339.0685	341.4491	335.9986	305.4558	244.9485	181.8629	186.0658	242.8458	281.0653	296.0725	303.9538	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	771.0083	752.6431	685.2451	578.2720	451.8407	310.1159	208.1042	217.4910	331.4015	489.9879	641.2445	766.5022	(97)
Space heating kWh													
	340.6347	277.9221	255.7842	174.4369	108.9104	0.0000	0.0000	0.0000	0.0000	155.4384	248.5239	344.1360	(98a)
Space heating requirement - total per year (kWh/year)												1905.7867	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	340.6347	277.9221	255.7842	174.4369	108.9104	0.0000	0.0000	0.0000	0.0000	155.4384	248.5239	344.1360	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1905.7867	
Space heating per m2											(98c) / (4) =	38.9971	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	543.1103	427.5549	438.2194	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.6386	0.7066	0.6829	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	346.8051	302.1063	299.2727	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	483.5303	464.7668	443.3646	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	98.4421	121.0194	107.2044	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	24.6105	30.2548	26.8011	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												81.6665	(107)
Energy for space heating												38.9971	(99)
Energy for space cooling												1.6711	(108)
Total												40.6682	(109)
Fabric Energy Efficiency (TFEE)												40.7	(109)

Full SAP Calculation Printout

Property Reference	78449-20	**Issued on Date**	03/10/2025
Assessment Reference	001	**Prop Type Ref**	Top Flat / End
Property	10 Shepherd Street, MANCHESTER, M9 4QW		

SAP Rating	81 B	**DER**	5.82	**TER**	15.12
Environmental	96 A	**% DER < TER**			61.51
CO_2 Emissions (t/year)	0.27	**DFEE**	36.57	**TFEE**	40.67
Compliance Check	See BREL	**% DFEE < TFEE**			10.09
% DPER < TPER	23.79	**DPER**	60.83	**TPER**	79.82

Assessor Details	Mr. Daniel Goddard	**Assessor ID**	CP52-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	3.0200 (1b)	x	2.8500 (2b)	=	8.6070	(1b) - (3b)
First floor	45.8500 (1c)	x	2.5200 (2c)	=	115.5420	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	48.8700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	124.1490	(5)

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2. Ventilation rate

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				m3 per hour	
Number of open chimneys			0 * 80 =	0.0000	(6a)
Number of open flues			0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire			0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler			0 * 20 =	0.0000	(6d)
Number of flues attached to other heater			0 * 35 =	0.0000	(6e)
Number of blocked chimneys			0 * 20 =	0.0000	(6f)
Number of intermittent extract fans			0 * 10 =	0.0000	(7a)
Number of passive vents			0 * 10 =	0.0000	(7b)
Number of flueless gas fires			0 * 40 =	0.0000	(7c)
				Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =			0.0000 / (5) =	0.0000	(8)
Pressure test				Yes	
Pressure Test Method				Blower Door	
Measured/design AP50				2.6400	(17)
Infiltration rate				0.1320	(18)
Number of sides sheltered				2	(19)
Shelter factor			(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =	0.1122	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1431	0.1403	0.1374	0.1234	0.1206	0.1066	0.1066	0.1038	0.1122	0.1206	0.1262	0.1318	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	80.1000	(23c)

Effective ac	0.2426	0.2397	0.2369	0.2229	0.2201	0.2061	0.2061	0.2033	0.2117	0.2201	0.2257	0.2313	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door			2.1500	0.7800	1.6770			(26)
Window			5.7300	0.7282	4.1723			(27)
GF			3.0200	0.0900	0.2718	75.0000	226.5000	(28a)
Exposed Floor			1.6100	0.1400	0.2254	20.0000	32.2000	(28b)
Main	67.2921	7.8800	59.4121	0.1300	7.7236	9.0000	534.7089	(29a)
PIJ	45.8500		45.8500	0.1100	5.0435	9.0000	412.6500	(30)
Flat	3.0200		3.0200	0.1200	0.3624	9.0000	27.1800	(30)
Total net area of external elements Aum(A, m2)			120.7921					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.4760			(33)
Main dwelling								
Party Wall 1			26.6500	0.0000	0.0000	20.0000	533.0000	(32)
Party Floor 1			37.9700			30.0000	1139.1000	(32d)
Timber			50.4000			9.0000	453.6000	(32c)
Internal Floor 1			6.2700			18.0000	112.8600	(32d)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 3471.7989 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 71.0415 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	5.8000	0.1150	0.6670
E3 Sill	5.8000	0.0170	0.0986
E4 Jamb	16.2000	0.0940	1.5228
E5 Ground floor (normal)	2.0100	0.0670	0.1347
E7 Party floor between dwellings (in blocks of flats)	21.8500	0.0320	0.6992
E16 Corner (normal)	10.0800	0.0680	0.6854
E17 Corner (inverted - internal area greater than external area)	5.0400	-0.0290	-0.1462
P1 Party wall - Ground floor	5.1000	0.0560	0.2856
E18 Party wall between dwellings	11.4000	0.2400	2.7360
E25 Staggered party wall between dwellings	5.0400	0.0560	0.2822
E20 Exposed floor (normal)	1.2700	0.3200	0.4064
E21 Exposed floor (inverted)	3.8100	0.3200	1.2192
E6 Intermediate floor within a dwelling	2.5800	0.0320	0.0826
E10 Eaves (insulation at ceiling level)	15.9700	0.0420	0.6707
E12 Gable (insulation at ceiling level)	8.4600	0.0770	0.6514
E14 Flat roof	2.0100	0.2050	0.4120
E24 Eaves (insulation at ceiling level - inverted)	2.0100	0.1500	0.3015
P4 Party wall - Roof (insulation at ceiling level)	4.9100	0.1020	0.5008
P5 Party wall - Roof (insulation at rafter level)	3.0000	0.4800	1.4400

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 12.6501 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 32.1261 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	9.9373	9.8224	9.7074	9.1328	9.0179	8.4433	8.4433	8.3284	8.6732	9.0179	9.2478	9.4776	(38)
Heat transfer coeff	42.0634	41.9484	41.8335	41.2589	41.1440	40.5694	40.5694	40.4545	40.7993	41.1440	41.3738	41.6037	(39)

Average = Sum(39)m / 12 = 41.2302

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8607	0.8584	0.8560	0.8443	0.8419	0.8301	0.8301	0.8278	0.8349	0.8419	0.8466	0.8513	(40)
HLP (average)												0.8437	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.6569 (42)
Hot water usage for mixer showers

52.0000	51.2186	50.0798	47.9010	46.2932	44.5001	43.4809	44.6110	45.8498	47.7751	50.0006	51.8008	(42a)

Hot water usage for baths

22.4849	22.1510	21.6808	20.8137	20.1645	19.4446	19.0557	19.5227	20.0311	20.8014	21.6863	22.4089	(42b)

Hot water usage for other uses

31.5982	30.4492	29.3001	28.1511	27.0021	25.8531	25.8531	27.0021	28.1511	29.3001	30.4492	31.5982	(42c)

Average daily hot water use (litres/day) 97.5150 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	106.0831	103.8187	101.0607	96.8659	93.4597	89.7977	88.3896	91.1358	94.0320	97.8766	102.1361	105.8079	(44)
Energy conte	168.0098	147.8365	155.3265	132.6045	125.8147	110.4167	106.8996	112.8451	115.9509	132.8176	145.5116	165.6696	(45)
Energy content (annual)										Total = Sum(45)m =		1619.7032	
Distribution loss (46)m = 0.15 x (45)m	25.2015	22.1755	23.2990	19.8907	18.8722	16.5625	16.0349	16.9268	17.3926	19.9226	21.8267	24.8504	(46)
Water storage loss:													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8694	(55)
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	194.9612	172.1797	182.2779	158.6865	152.7661	136.4987	133.8510	139.7965	142.0329	159.7690	171.5936	192.6210	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	194.9612	172.1797	182.2779	158.6865	152.7661	136.4987	133.8510	139.7965	142.0329	159.7690	171.5936	192.6210	(64)
										Total per year (kWh/year) = Sum(64)m =		1937.0342	(64)
12Total per year (kWh/year)												1937	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	55.8632	49.1556	51.6461	44.0910	41.8334	36.7136	35.5441	37.5210	38.5537	44.1619	48.3826	55.0851	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	83.5900	92.5461	83.5900	86.3763	83.5900	86.3763	83.5900	83.5900	86.3763	83.5900	86.3763	83.5900	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	144.2994	145.7968	142.0235	133.9905	123.8503	114.3199	107.9530	106.4556	110.2290	118.2620	128.4022	137.9326	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	(71)
Water heating gains (Table 5)	75.0850	73.1483	69.4168	61.2375	56.2277	50.9911	47.7744	50.4314	53.5468	59.3573	67.1981	74.0392	(72)
Total internal gains	350.8277	359.3444	342.8835	329.4576	311.5213	299.5406	287.1707	288.3304	298.0054	309.0626	329.8299	343.4150	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	2.8600	10.6334	0.3800	0.0000	0.7700	8.8984	(74)
South	2.0500	46.7521	0.3800	0.0000	0.7700	28.0433	(78)
West	0.8200	19.6403	0.3800	0.0000	0.7700	4.7123	(80)

Solar gains	41.6540	72.1513	102.5811	134.6775	158.5625	161.0216	153.7257	135.2141	113.5130	80.7182	50.0939	35.5253	(83)
Total gains	392.4818	431.4958	445.4647	464.1351	470.0837	460.5622	440.8964	423.5445	411.5184	389.7808	379.9238	378.9404	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	22.9270	22.9899	23.0530	23.3741	23.4393	23.7713	23.7713	23.8388	23.6374	23.4393	23.3091	23.1804	
alpha	2.5285	2.5327	2.5369	2.5583	2.5626	2.5848	2.5848	2.5893	2.5758	2.5626	2.5539	2.5454	
util living area	0.8838	0.8539	0.8173	0.7446	0.6420	0.4996	0.3806	0.4085	0.5747	0.7520	0.8473	0.8912	(86)
MIT	18.9551	19.2329	19.6023	20.1096	20.5309	20.8276	20.9377	20.9235	20.7378	20.2178	19.5340	18.9132	(87)
Th 2	20.2010	20.2030	20.2050	20.2151	20.2172	20.2273	20.2273	20.2293	20.2232	20.2172	20.2131	20.2091	(88)
util rest of house	0.8733	0.8411	0.8008	0.7211	0.6077	0.4514	0.3205	0.3481	0.5278	0.7247	0.8320	0.8813	(89)
MIT 2	17.7947	18.1417	18.6031	19.2320	19.7349	20.0744	20.1834	20.1733	19.9795	19.3741	18.5307	17.7476	(90)
Living area fraction										fLA = Living area / (4) =		0.3912	(91)
MIT	18.2487	18.5686	18.9940	19.5753	20.0464	20.3691	20.4785	20.4668	20.2762	19.7042	18.9232	18.2036	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.2487	18.5686	18.9940	19.5753	20.0464	20.3691	20.4785	20.4668	20.2762	19.7042	18.9232	18.2036	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8420	0.8099	0.7720	0.6999	0.5997	0.4605	0.3405	0.3672	0.5312	0.7049	0.8024	0.8505	(94)
Useful gains	330.4567	349.4810	343.8769	324.8445	281.9323	212.1001	150.1119	155.5234	218.5885	274.7413	304.8530	322.2875	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	586.7290	573.3759	522.6701	440.4520	343.4032	234.0487	157.3476	164.5214	251.9842	374.5833	489.1722	582.6019	(97)
Space heating kWh	190.6666	150.4574	133.0222	83.2374	45.7343	0.0000	0.0000	0.0000	0.0000	74.2824	132.7098	193.6739	(98a)
Space heating requirement - total per year (kWh/year)												1003.7841	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	190.6666	150.4574	133.0222	83.2374	45.7343	0.0000	0.0000	0.0000	0.0000	74.2824	132.7098	193.6739	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1003.7841	
Space heating per m2											(98c) / (4) =	20.5399	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	190.6666	150.4574	133.0222	83.2374	45.7343	0.0000	0.0000	0.0000	0.0000	74.2824	132.7098	193.6739	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	190.6666	150.4574	133.0222	83.2374	45.7343	0.0000	0.0000	0.0000	0.0000	74.2824	132.7098	193.6739	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	194.9612	172.1797	182.2779	158.6865	152.7661	136.4987	133.8510	139.7965	142.0329	159.7690	171.5936	192.6210	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month	60.0768	53.0567	56.1685	48.8988	47.0745	42.0617	41.2458	43.0779	43.7671	49.2324	52.8761	59.3557	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	15.6682	14.1519	15.6682	15.1628	15.6682	15.1628	15.6682	15.6682	15.1628	15.6682	15.1628	15.6682	(231)
Lighting	16.7415	13.4307	12.0928	8.8597	6.8435	5.5912	6.2429	8.1147	10.5402	13.8293	15.6202	17.2068	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													

(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1003.7841	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	324.5200	
Water heating fuel used	596.8921	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.2180)		
mechanical ventilation fans (SFP = 1.2180)	184.4804	(230a)
Total electricity for the above, kWh/year	184.4804	(231)
Electricity for lighting (calculated in Appendix L)	135.1135	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	1920.2701	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1003.7841	0.1546	155.1546	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	596.8921	0.1411	84.2266	(264)
Space and water heating			239.3812	(265)
Pumps, fans and electric keep-hot	184.4804	0.1387	25.5897	(267)
Energy for lighting	135.1135	0.1443	19.5011	(268)
Total CO2, kg/year			284.4719	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			5.8200	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1003.7841	1.5723	1578.2011	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	596.8921	1.5218	908.3378	(278)
Space and water heating			2486.5389	(279)
Pumps, fans and electric keep-hot	184.4804	1.5128	279.0820	(281)
Energy for lighting	135.1135	1.5338	207.2416	(282)
Total Primary energy kWh/year			2972.8625	(286)
Dwelling Primary energy Rate (DPER)			60.8300	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	3.0200 (1b)	x	2.8500 (2b)	=	8.6070	(1b) - (3b)
First floor	45.8500 (1c)	x	2.5200 (2c)	=	115.5420	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	48.8700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	124.1490	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1611	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)

Infiltration rate	0.4111	(18)
Number of sides sheltered	2	(19)
Shelter factor (20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) =	0.3494	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4455	0.4368	0.4281	0.3844	0.3756	0.3320	0.3320	0.3232	0.3494	0.3756	0.3931	0.4106	(22b)
Effective ac	0.5992	0.5954	0.5916	0.5739	0.5706	0.5551	0.5551	0.5522	0.5611	0.5706	0.5773	0.5843	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			2.1500	1.0000	2.1500			(26)
TER Opening Type			5.7300	1.1450	6.5611			(27)
GF			3.0200	0.1300	0.3926			(28a)
Exposed Floor			1.6100	0.1300	0.2093			(28b)
Main	67.2921	7.8800	59.4121	0.1800	10.6942			(29a)
PIJ	45.8500		45.8500	0.1100	5.0435			(30)
Flat	3.0200		3.0200	0.1100	0.3322			(30)
Total net area of external elements Aum(A, m2)			120.7921					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		25.3828			(33)
Main dwelling								
Party Wall 1			26.6500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	71.0415	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	5.8000	0.0500	0.2900
E3 Sill	5.8000	0.0500	0.2900
E4 Jamb	16.2000	0.0500	0.8100
E5 Ground floor (normal)	2.0100	0.1600	0.3216
E7 Party floor between dwellings (in blocks of flats)	21.8500	0.0700	1.5295
E16 Corner (normal)	10.0800	0.0900	0.9072
E17 Corner (inverted - internal area greater than external area)	5.0400	-0.0900	-0.4536
P1 Party wall - Ground floor	5.1000	0.0800	0.4080
E18 Party wall between dwellings	11.4000	0.0600	0.6840
E25 Staggered party wall between dwellings	5.0400	0.0600	0.3024
E20 Exposed floor (normal)	1.2700	0.3200	0.4064
E21 Exposed floor (inverted)	3.8100	0.3200	1.2192
E6 Intermediate floor within a dwelling	2.5800	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	15.9700	0.0600	0.9582
E12 Gable (insulation at ceiling level)	8.4600	0.0600	0.5076
E14 Flat roof	2.0100	0.0800	0.1608
E24 Eaves (insulation at ceiling level - inverted)	2.0100	0.2400	0.4824
P4 Party wall - Roof (insulation at ceiling level)	4.9100	0.1200	0.5892
P5 Party wall - Roof (insulation at rafter level)	3.0000	0.0800	0.2400

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	9.6529	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	35.0357	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	24.5506	24.3928	24.2380	23.5111	23.3751	22.7419	22.7419	22.6247	22.9858	23.3751	23.6502	23.9378	(38)
Heat transfer coeff	59.5864	59.4285	59.2737	58.5468	58.4108	57.7777	57.7777	57.6604	58.0216	58.4108	58.6859	58.9736	(39)
Average = Sum(39)m / 12 =												58.5462	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2193	1.2161	1.2129	1.1980	1.1952	1.1823	1.1823	1.1799	1.1873	1.1952	1.2009	1.2067	(40)
HLP (average)												1.1980	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.6569	(42)

Hot water usage for mixer showers

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	52.0000	51.2186	50.0798	47.9010	46.2932	44.5001	43.4809	44.6110	45.8498	47.7751	50.0006	51.8008	(42a)

Hot water usage for baths

	22.4849	22.1510	21.6808	20.8137	20.1645	19.4446	19.0557	19.5227	20.0311	20.8014	21.6863	22.4089	(42b)

Hot water usage for other uses

	31.5982	30.4492	29.3001	28.1511	27.0021	25.8531	25.8531	27.0021	28.1511	29.3001	30.4492	31.5982	(42c)

Average daily hot water use (litres/day)	97.5150 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	106.0831	103.8187	101.0607	96.8659	93.4597	89.7977	88.3896	91.1358	94.0320	97.8766	102.1361	105.8079	(44)
Energy conte	168.0098	147.8365	155.3265	132.6045	125.8147	110.4167	106.8996	112.8451	115.9509	132.8176	145.5116	165.6696	(45)
Energy content (annual)										Total = Sum(45)m =		1619.7032	

Distribution loss (46)m = 0.15 x (45)m

	25.2015	22.1755	23.2990	19.8907	18.8722	16.5625	16.0349	16.9268	17.3926	19.9226	21.8267	24.8504	(46)

Water storage loss:	
Store volume	150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):	1.3938 (48)
Temperature factor from Table 2b	0.5400 (49)
Enter (49) or (54) in (55)	0.7527 (55)

Total storage loss

	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)

If cylinder contains dedicated solar storage

	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

	214.6047	189.9222	201.9214	177.6964	172.4096	155.5086	153.4945	159.4400	161.0427	179.4125	190.6035	212.2645	(62)
WWHRS	-23.7722	-21.0244	-22.0155	-18.2297	-16.9894	-14.5380	-13.6270	-14.4910	-15.0415	-17.7323	-20.0886	-23.3320	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

	190.8324	168.8978	179.9059	159.4667	155.4202	140.9706	139.8675	144.9490	146.0012	161.6802	170.5149	188.9325 (64)
Total per year (kWh/year) = Sum(64)m =												1947.4390 (64)
12Total per year (kWh/year)												1947 (64)
Electric shower(s)												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000 (64a)
Heat gains from water heating, kWh/month												
	93.1392	82.8242	88.9220	80.1645	79.1093	72.7870	72.8200	74.7969	74.6271	81.4378	84.4561	92.3611 (65)

5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	81.2011	89.9012	81.2011	83.9078	81.2011	83.9078	81.2011	81.2011	83.9078	81.2011	83.9078	81.2011	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	144.2994	145.7968	142.0235	133.9905	123.8503	114.3199	107.9530	106.4556	110.2290	118.2620	128.4022	137.9326	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	(71)
Water heating gains (Table 5)													
	125.1871	123.2503	119.5188	111.3395	106.3297	101.0931	97.8764	100.5335	103.6488	109.4594	117.3001	124.1412	(72)
Total internal gains													
	401.5409	409.8016	393.5967	380.0911	362.2344	347.1741	334.8838	336.0435	345.6389	359.7758	380.4634	394.1282	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	2.8600	10.6334	0.6300	0.7000	0.7700	9.2941	(74)
South	2.0500	46.7521	0.6300	0.7000	0.7700	29.2905	(78)
West	0.8200	19.6403	0.6300	0.7000	0.7700	4.9219	(80)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	43.5065	75.3601	107.1433	140.6671	165.6143	168.1828	160.5625	141.2276	118.5614	84.3081	52.3218	37.1053	(83)
Total gains	445.0474	485.1618	500.7400	520.7582	527.8487	515.3569	495.4463	477.2711	464.2003	444.0838	432.7852	431.2334	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	16.1847	16.2277	16.2701	16.4721	16.5104	16.6914	16.6914	16.7253	16.6212	16.5104	16.4330	16.3529	
alpha	2.0790	2.0818	2.0847	2.0981	2.1007	2.1128	2.1128	2.1150	2.1081	2.1007	2.0955	2.0902	
util living area													
	0.8867	0.8632	0.8331	0.7740	0.6872	0.5615	0.4434	0.4709	0.6269	0.7759	0.8553	0.8925	(86)
MIT	18.0516	18.3549	18.8226	19.4876	20.1049	20.5991	20.8277	20.7978	20.4560	19.6963	18.7955	18.0098	(87)
Th 2	19.9046	19.9072	19.9097	19.9216	19.9238	19.9342	19.9342	19.9361	19.9302	19.9238	19.9193	19.9146	(88)
util rest of house													
	0.8743	0.8484	0.8141	0.7464	0.6451	0.4964	0.3547	0.3836	0.5667	0.7436	0.8373	0.8807	(89)
MIT 2	16.5191	16.8959	17.4784	18.2996	19.0385	19.6007	19.8266	19.8036	19.4523	18.5667	17.4573	16.4706	(90)
Living area fraction									fLA = Living area / (4) =			0.3912	(91)
MIT	17.1187	17.4667	18.0043	18.7644	19.4557	19.9913	20.2183	20.1926	19.8450	19.0086	17.9809	17.0728	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.1187	17.4667	18.0043	18.7644	19.4557	19.9913	20.2183	20.1926	19.8450	19.0086	17.9809	17.0728	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8325	0.8059	0.7728	0.7115	0.6245	0.5001	0.3797	0.4060	0.5614	0.7109	0.7963	0.8396	(94)
Useful gains	370.4933	390.9897	386.9657	370.5384	329.6269	257.7521	188.1079	193.7498	260.5952	315.7120	344.6092	362.0700	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	763.8196	746.8206	681.9015	577.5299	453.0180	311.4968	209.0571	218.6804	333.3343	491.1537	638.5562	759.1545	(97)
Space heating kWh													
	292.6348	239.1184	219.4322	149.0339	91.8029	0.0000	0.0000	0.0000	0.0000	130.5286	211.6418	295.4309	(98a)
Space heating requirement - total per year (kWh/year)												1629.6235	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	292.6348	239.1184	219.4322	149.0339	91.8029	0.0000	0.0000	0.0000	0.0000	130.5286	211.6418	295.4309	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1629.6235	
Space heating per m2											(98c) / (4) =	33.3461	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	292.6348	239.1184	219.4322	149.0339	91.8029	0.0000	0.0000	0.0000	0.0000	130.5286	211.6418	295.4309	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													

	317.0474	259.0665	237.7380	161.4668	99.4615	0.0000	0.0000	0.0000	0.0000	141.4178	229.2977	320.0768 (211)
Space heating efficiency (main heating system 2)												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement												
	190.8324	168.8978	179.9059	159.4667	155.4202	140.9706	139.8675	144.9490	146.0012	161.6802	170.5149	188.9325 (64)
Efficiency of water heater												79.8000 (216)
(217)m	85.0154	84.8392	84.5063	83.9083	82.9208	79.8000	79.8000	79.8000	79.8000	83.5841	84.5455	85.0581 (217)
Fuel for water heating, kWh/month												
	224.4681	199.0799	212.8906	190.0487	187.4322	176.6549	175.2725	181.6404	182.9589	193.4341	201.6842	222.1216 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	16.8720	13.5353	12.1871	8.9288	6.8968	5.6348	6.2915	8.1780	10.6224	13.9371	15.7419	17.3409 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-23.3618	-33.1899	-48.0847	-54.5349	-59.2499	-55.5210	-54.9018	-51.6559	-45.9280	-38.2405	-25.7999	-20.1733 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-12.4159	-26.2127	-52.2550	-78.6854	-104.2042	-104.7074	-103.4098	-87.4228	-63.9461	-37.4757	-16.5791	-9.8055 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year	
Space heating fuel - main system 1	1765.5726 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	79.8000
Water heating fuel used	2347.6863 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
Total electricity for the above, kWh/year	86.0000 (231)
Electricity for lighting (calculated in Appendix L)	136.1665 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-1207.7611 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	3127.6643 (238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1765.5726	0.2100	370.7702	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2347.6863	0.2100	493.0141	(264)
Space and water heating			863.7844	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	136.1665	0.1443	19.6530	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-510.6416	0.1344	-68.6248	
PV Unit electricity exported	-697.1195	0.1258	-87.7220	
Total			-156.3468	(269)
Total CO2, kg/year			739.0198	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			15.1200	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1765.5726	1.1300	1995.0970	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2347.6863	1.1300	2652.8855	(278)
Space and water heating			4647.9825	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	136.1665	1.5338	208.8568	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-510.6416	1.4967	-764.2616	
PV Unit electricity exported	-697.1195	0.4619	-321.9990	
Total			-1086.2606	(283)
Total Primary energy kWh/year			3900.6795	(286)
Target Primary Energy Rate (TPER)			79.8200	(287)

Full SAP Calculation Printout

Property Reference	78449-20	**Issued on Date**	03/10/2025
Assessment Reference	001	**Prop Type Ref**	Top Flat / End
Property	10 Shepherd Street, MANCHESTER, M9 4QW		

SAP Rating	81 B	**DER**	5.82	**TER**	15.12
Environmental	96 A	**% DER < TER**			61.51
CO_2 Emissions (t/year)	0.27	**DFEE**	36.57	**TFEE**	40.67
Compliance Check	See BREL	**% DFEE < TFEE**			10.09
% DPER < TPER	23.79	**DPER**	60.83	**TPER**	79.82

Assessor Details	Mr. Daniel Goddard	**Assessor ID**	CP52-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	3.0200 (1b)	x	2.8500 (2b)	=	8.6070	(1b) - (3b)
First floor	45.8500 (1c)	x	2.5200 (2c)	=	115.5420	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	48.8700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	124.1490	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.6400	(17)
Infiltration rate		0.1320	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1122	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1431	0.1403	0.1374	0.1234	0.1206	0.1066	0.1066	0.1038	0.1122	0.1206	0.1262	0.1318	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	80.1000	(23c)

Effective ac	0.2426	0.2397	0.2369	0.2229	0.2201	0.2061	0.2061	0.2033	0.2117	0.2201	0.2257	0.2313	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door			2.1500	0.7800	1.6770			(26)
Window			5.7300	0.7282	4.1723			(27)
GF			3.0200	0.0900	0.2718	75.0000	226.5000	(28a)
Exposed Floor			1.6100	0.1400	0.2254	20.0000	32.2000	(28b)
Main	67.2921	7.8800	59.4121	0.1300	7.7236	9.0000	534.7089	(29a)
PIJ	45.8500		45.8500	0.1100	5.0435	9.0000	412.6500	(30)
Flat	3.0200		3.0200	0.1200	0.3624	9.0000	27.1800	(30)
Total net area of external elements Aum(A, m2)			120.7921					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.4760			(33)
Main dwelling								
Party Wall 1			26.6500	0.0000	0.0000	20.0000	533.0000	(32)
Party Floor 1			37.9700			30.0000	1139.1000	(32d)
Timber			50.4000			9.0000	453.6000	(32c)
Internal Floor 1			6.2700			18.0000	112.8600	(32d)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 3471.7989 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 71.0415 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	5.8000	0.1150	0.6670
E3 Sill	5.8000	0.0170	0.0986
E4 Jamb	16.2000	0.0940	1.5228
E5 Ground floor (normal)	2.0100	0.0670	0.1347
E7 Party floor between dwellings (in blocks of flats)	21.8500	0.0320	0.6992
E16 Corner (normal)	10.0800	0.0680	0.6854
E17 Corner (inverted - internal area greater than external area)	5.0400	-0.0290	-0.1462
P1 Party wall - Ground floor	5.1000	0.0560	0.2856
E18 Party wall between dwellings	11.4000	0.2400	2.7360
E25 Staggered party wall between dwellings	5.0400	0.0560	0.2822
E20 Exposed floor (normal)	1.2700	0.3200	0.4064
E21 Exposed floor (inverted)	3.8100	0.3200	1.2192
E6 Intermediate floor within a dwelling	2.5800	0.0320	0.0826
E10 Eaves (insulation at ceiling level)	15.9700	0.0420	0.6707
E12 Gable (insulation at ceiling level)	8.4600	0.0770	0.6514
E14 Flat roof	2.0100	0.2050	0.4120
E24 Eaves (insulation at ceiling level - inverted)	2.0100	0.1500	0.3015
P4 Party wall - Roof (insulation at ceiling level)	4.9100	0.1020	0.5008
P5 Party wall - Roof (insulation at rafter level)	3.0000	0.4800	1.4400

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 12.6501 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 32.1261 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	9.9373	9.8224	9.7074	9.1328	9.0179	8.4433	8.4433	8.3284	8.6732	9.0179	9.2478	9.4776	(38)
Heat transfer coeff	42.0634	41.9484	41.8335	41.2589	41.1440	40.5694	40.5694	40.4545	40.7993	41.1440	41.3738	41.6037	(39)

Average = Sum(39)m / 12 = 41.2302

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8607	0.8584	0.8560	0.8443	0.8419	0.8301	0.8301	0.8278	0.8349	0.8419	0.8466	0.8513	(40)
HLP (average)												0.8437	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.6569 (42)
Hot water usage for mixer showers

52.0000	51.2186	50.0798	47.9010	46.2932	44.5001	43.4809	44.6110	45.8498	47.7751	50.0006	51.8008	(42a)

Hot water usage for baths

22.4849	22.1510	21.6808	20.8137	20.1645	19.4446	19.0557	19.5227	20.0311	20.8014	21.6863	22.4089	(42b)

Hot water usage for other uses

31.5982	30.4492	29.3001	28.1511	27.0021	25.8531	25.8531	27.0021	28.1511	29.3001	30.4492	31.5982	(42c)

Average daily hot water use (litres/day) 97.5150 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	106.0831	103.8187	101.0607	96.8659	93.4597	89.7977	88.3896	91.1358	94.0320	97.8766	102.1361	105.8079	(44)
Energy conte	168.0098	147.8365	155.3265	132.6045	125.8147	110.4167	106.8996	112.8451	115.9509	132.8176	145.5116	165.6696	(45)
Energy content (annual)										Total = Sum(45)m =		1619.7032	
Distribution loss (46)m = 0.15 x (45)m	25.2015	22.1755	23.2990	19.8907	18.8722	16.5625	16.0349	16.9268	17.3926	19.9226	21.8267	24.8504	(46)
Water storage loss:													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8694	(55)
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	194.9612	172.1797	182.2779	158.6865	152.7661	136.4987	133.8510	139.7965	142.0329	159.7690	171.5936	192.6210	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	194.9612	172.1797	182.2779	158.6865	152.7661	136.4987	133.8510	139.7965	142.0329	159.7690	171.5936	192.6210	(64)
										Total per year (kWh/year) = Sum(64)m =		1937.0342	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	55.8632	49.1556	51.6461	44.0910	41.8334	36.7136	35.5441	37.5210	38.5537	44.1619	48.3826	55.0851	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	99.4132	99.4132	99.4132	99.4132	99.4132	99.4132	99.4132	99.4132	99.4132	99.4132	99.4132	99.4132	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	19.1267	16.9882	13.8157	10.4594	7.8185	6.6007	7.1323	9.2708	12.4433	15.7996	18.4405	19.6583	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	215.3723	217.6072	211.9753	199.9858	184.8511	170.6267	161.1239	158.8890	164.5209	176.5104	191.6451	205.8695	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	46.5982	46.5982	46.5982	46.5982	46.5982	46.5982	46.5982	46.5982	46.5982	46.5982	46.5982	46.5982	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	(71)
Water heating gains (Table 5)	75.0850	73.1483	69.4168	61.2375	56.2277	50.9911	47.7744	50.4314	53.5468	59.3573	67.1981	74.0392	(72)
Total internal gains	389.3200	387.4796	374.9438	351.4186	328.6333	307.9544	295.7665	298.3273	310.2469	331.4033	357.0196	379.3029	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	2.8600	10.6334	0.3800	0.0000	0.7700	8.8984	(74)
South	2.0500	46.7521	0.3800	0.0000	0.7700	28.0433	(78)
West	0.8200	19.6403	0.3800	0.0000	0.7700	4.7123	(80)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	41.6540	72.1513	102.5811	134.6775	158.5625	161.0216	153.7257	135.2141	113.5130	80.7182	50.0939	35.5253	(83)
Total gains	430.9740	459.6309	477.5249	486.0961	487.1958	468.9760	449.4922	433.5414	423.7599	412.1216	407.1135	414.8282	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	22.9270	22.9899	23.0530	23.3741	23.4393	23.7713	23.7713	23.8388	23.6374	23.4393	23.3091	23.1804	
alpha	2.5285	2.5327	2.5369	2.5583	2.5626	2.5848	2.5848	2.5893	2.5758	2.5626	2.5539	2.5454	
util living area	0.8632	0.8378	0.7969	0.7285	0.6281	0.4927	0.3743	0.4004	0.5631	0.7327	0.8290	0.8722	(86)
MIT	19.0997	19.3287	19.6970	20.1588	20.5554	20.8333	20.9401	20.9270	20.7503	20.2691	19.6244	19.0523	(87)
Th 2	20.2010	20.2030	20.2050	20.2151	20.2172	20.2273	20.2273	20.2293	20.2232	20.2172	20.2131	20.2091	(88)
util rest of house	0.8514	0.8241	0.7793	0.7043	0.5937	0.4448	0.3149	0.3409	0.5165	0.7045	0.8126	0.8611	(89)
MIT 2	17.9731	18.2589	18.7171	19.2891	19.7614	20.0796	20.1852	20.1760	19.9918	19.4328	18.6400	17.9196	(90)
Living area fraction										fLA = Living area / (4) =		0.3912	(91)
MIT	18.4139	18.6774	19.1005	19.6294	20.0720	20.3745	20.4805	20.4698	20.2886	19.7600	19.0251	18.3628	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.4139	18.6774	19.1005	19.6294	20.0720	20.3745	20.4805	20.4698	20.2886	19.7600	19.0251	18.3628	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8199	0.7934	0.7517	0.6846	0.5869	0.4542	0.3348	0.3599	0.5206	0.6865	0.7838	0.8298	(94)
Useful gains	353.3502	364.6787	358.9728	332.7727	285.9323	213.0049	150.4744	156.0530	220.5931	282.9069	319.0759	344.2287	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	593.6772	577.9418	527.1234	442.6831	344.4594	234.2669	157.4304	164.6434	252.4883	376.8784	493.3892	589.2246	(97)
Space heating kWh	178.8033	143.3128	125.1040	79.1355	43.5442	0.0000	0.0000	0.0000	0.0000	69.9148	125.5056	182.2769	(98a)
Space heating requirement - total per year (kWh/year)												947.5971	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	178.8033	143.3128	125.1040	79.1355	43.5442	0.0000	0.0000	0.0000	0.0000	69.9148	125.5056	182.2769	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												947.5971	
Space heating per m2										(98c) / (4) =		19.3902	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	178.8033	143.3128	125.1040	79.1355	43.5442	0.0000	0.0000	0.0000	0.0000	69.9148	125.5056	182.2769	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	178.8033	143.3128	125.1040	79.1355	43.5442	0.0000	0.0000	0.0000	0.0000	69.9148	125.5056	182.2769	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	194.9612	172.1797	182.2779	158.6865	152.7661	136.4987	133.8510	139.7965	142.0329	159.7690	171.5936	192.6210	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month	60.0768	53.0567	56.1685	48.8988	47.0745	42.0617	41.2458	43.0779	43.7671	49.2324	52.8761	59.3557	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	15.6682	14.1519	15.6682	15.1628	15.6682	15.1628	15.6682	15.6682	15.1628	15.6682	15.1628	15.6682	(231)
Lighting	16.7415	13.4307	12.0928	8.8597	6.8435	5.5912	6.2429	8.1147	10.5402	13.8293	15.6202	17.2068	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	947.5971	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	324.5200	
Water heating fuel used	596.8921	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.2180)		
mechanical ventilation fans (SFP = 1.2180)	184.4804	(230a)
Total electricity for the above, kWh/year	184.4804	(231)
Electricity for lighting (calculated in Appendix L)	135.1135	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	1864.0831	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	947.5971	16.4900	156.2588	(240)
Space heating - main system 2	0.0000	16.4900	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	596.8921	16.4900	98.4275	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	184.4804	16.4900	30.4208	(249)
Energy for lighting	135.1135	16.4900	22.2802	(250)
Additional standing charges			0.0000	(251)
Total energy cost			307.3873	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.1789	(257)
SAP value		80.8907	
SAP rating (Section 12)		81	(258)
SAP band		B	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	947.5971	0.1545	146.4510	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	596.8921	0.1411	84.2266	(264)
Space and water heating			230.6776	(265)
Pumps, fans and electric keep-hot	184.4804	0.1387	25.5897	(267)
Energy for lighting	135.1135	0.1443	19.5011	(268)
Total CO2, kg/year			275.7684	(272)
CO2 emissions per m2			5.6400	(273)
EI value			96.0634	
EI rating			96	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	3.0200	(1b) x	2.8500	(2b) =	8.6070	(1b) - (3b)
First floor	45.8500	(1c) x	2.5200	(2c) =	115.5420	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	48.8700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		124.1490	(5)

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2. Ventilation rate

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	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)

Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.6400	(17)
Infiltration rate		0.1320	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1122	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.6000	4.5000	4.5000	4.1000	4.2000	3.7000	3.5000	3.5000	3.7000	4.1000	4.1000	4.2000	(22)
Wind factor	1.1500	1.1250	1.1250	1.0250	1.0500	0.9250	0.8750	0.8750	0.9250	1.0250	1.0250	1.0500	(22a)
Adj infilt rate	0.1290	0.1262	0.1262	0.1150	0.1178	0.1038	0.0982	0.0982	0.1038	0.1150	0.1150	0.1178	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	80.1000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2285	0.2257	0.2257	0.2145	0.2173	0.2033	0.1977	0.1977	0.2033	0.2145	0.2145	0.2173	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Door			2.1500	0.7800	1.6770			(26)
Window			5.7300	0.7282	4.1723			(27)
GF			3.0200	0.0900	0.2718	75.0000	226.5000	(28a)
Exposed Floor			1.6100	0.1400	0.2254	20.0000	32.2000	(28b)
Main	67.2921	7.8800	59.4121	0.1300	7.7236	9.0000	534.7089	(29a)
PIJ	45.8500		45.8500	0.1100	5.0435	9.0000	412.6500	(30)
Flat	3.0200		3.0200	0.1200	0.3624	9.0000	27.1800	(30)
Total net area of external elements Aum(A, m2)			120.7921					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.4760			(33)
Main dwelling								
Party Wall 1			26.6500	0.0000	0.0000	20.0000	533.0000	(32)
Party Floor 1			37.9700			30.0000	1139.1000	(32d)
Timber			50.4000			9.0000	453.6000	(32c)
Internal Floor 1			6.2700			18.0000	112.8600	(32d)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	3471.7989 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		71.0415 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	5.8000	0.1150	0.6670
E3 Sill	5.8000	0.0170	0.0986
E4 Jamb	16.2000	0.0940	1.5228
E5 Ground floor (normal)	2.0100	0.0670	0.1347
E7 Party floor between dwellings (in blocks of flats)	21.8500	0.0320	0.6992
E16 Corner (normal)	10.0800	0.0680	0.6854
E17 Corner (inverted - internal area greater than external area)	5.0400	-0.0290	-0.1462
P1 Party wall - Ground floor	5.1000	0.0560	0.2856
E18 Party wall between dwellings	11.4000	0.2400	2.7360
E25 Staggered party wall between dwellings	5.0400	0.0560	0.2822
E20 Exposed floor (normal)	1.2700	0.3200	0.4064
E21 Exposed floor (inverted)	3.8100	0.3200	1.2192
E6 Intermediate floor within a dwelling	2.5800	0.0320	0.0826
E10 Eaves (insulation at ceiling level)	15.9700	0.0420	0.6707
E12 Gable (insulation at ceiling level)	8.4600	0.0770	0.6514
E14 Flat roof	2.0100	0.2050	0.4120
E24 Eaves (insulation at ceiling level - inverted)	2.0100	0.1500	0.3015
P4 Party wall - Roof (insulation at ceiling level)	4.9100	0.1020	0.5008
P5 Party wall - Roof (insulation at rafter level)	3.0000	0.4800	1.4400

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		12.6501 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	32.1261 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	9.3627	9.2478	9.2478	8.7881	8.9030	8.3284	8.0986	8.0986	8.3284	8.7881	8.7881	8.9030	(38)
Heat transfer coeff	41.4888	41.3738	41.3738	40.9142	41.0291	40.4545	40.2247	40.2247	40.4545	40.9142	40.9142	41.0291	(39)
Average = Sum(39)m / 12 =												40.8663	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8490	0.8466	0.8466	0.8372	0.8396	0.8278	0.8231	0.8231	0.8278	0.8372	0.8372	0.8396	(40)
HLP (average)												0.8362	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.6569	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	52.0000	51.2186	50.0798	47.9010	46.2932	44.5001	43.4809	44.6110	45.8498	47.7751	50.0006	51.8008	(42a)
Hot water usage for baths	22.4849	22.1510	21.6808	20.8137	20.1645	19.4446	19.0557	19.5227	20.0311	20.8014	21.6863	22.4089	(42b)
Hot water usage for other uses	31.5982	30.4492	29.3001	28.1511	27.0021	25.8531	25.8531	27.0021	28.1511	29.3001	30.4492	31.5982	(42c)
Average daily hot water use (litres/day)												97.5150	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use												

	106.0831	103.8187	101.0607	96.8659	93.4597	89.7977	88.3896	91.1358	94.0320	97.8766	102.1361	105.8079	(44)
Energy conte	168.0098	147.8365	155.3265	132.6045	125.8147	110.4167	106.8996	112.8451	115.9509	132.8176	145.5116	165.6696	(45)
Energy content (annual)										Total = Sum(45)m =		1619.7032	
Distribution loss (46)m = 0.15 x (45)m													
	25.2015	22.1755	23.2990	19.8907	18.8722	16.5625	16.0349	16.9268	17.3926	19.9226	21.8267	24.8504	(46)
Water storage loss:													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8694	(55)
Total storage loss													
	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage													
	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	194.9612	172.1797	182.2779	158.6865	152.7661	136.4987	133.8510	139.7965	142.0329	159.7690	171.5936	192.6210	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	194.9612	172.1797	182.2779	158.6865	152.7661	136.4987	133.8510	139.7965	142.0329	159.7690	171.5936	192.6210	(64)
										Total per year (kWh/year) = Sum(64)m =		1937.0342	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	55.8632	49.1556	51.6461	44.0910	41.8334	36.7136	35.5441	37.5210	38.5537	44.1619	48.3826	55.0851	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	99.4132	99.4132	99.4132	99.4132	99.4132	99.4132	99.4132	99.4132	99.4132	99.4132	99.4132	99.4132	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	19.1267	16.9882	13.8157	10.4594	7.8185	6.6007	7.1323	9.2708	12.4433	15.7996	18.4405	19.6583	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	215.3723	217.6072	211.9753	199.9858	184.8511	170.6267	161.1239	158.8890	164.5209	176.5104	191.6451	205.8695	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	46.5982	46.5982	46.5982	46.5982	46.5982	46.5982	46.5982	46.5982	46.5982	46.5982	46.5982	46.5982	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	(71)
Water heating gains (Table 5)	75.0850	73.1483	69.4168	61.2375	56.2277	50.9911	47.7744	50.4314	53.5468	59.3573	67.1981	74.0392	(72)
Total internal gains	389.3200	387.4796	374.9438	351.4186	328.6333	307.9544	295.7665	298.3273	310.2469	331.4033	357.0196	379.3029	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	2.8600	8.9975	0.3800	0.0000	0.7700	7.5294	(74)
South	2.0500	39.5594	0.3800	0.0000	0.7700	23.7289	(78)
West	0.8200	16.6187	0.3800	0.0000	0.7700	3.9874	(80)

Solar gains	35.2457	64.1345	96.1698	128.3926	147.8265	152.9705	143.1520	124.0180	107.5906	74.6032	44.0219	32.1420	(83)
Total gains	424.5657	451.6141	471.1136	479.8112	476.4598	460.9249	438.9185	422.3453	417.8375	406.0065	401.0415	411.4449	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	23.2446	23.3091	23.3091	23.5710	23.5050	23.8388	23.9751	23.9751	23.8388	23.5710	23.5710	23.5050	
alpha	2.5496	2.5539	2.5539	2.5714	2.5670	2.5893	2.5983	2.5983	2.5893	2.5714	2.5714	2.5670	
util living area													
	0.8595	0.8339	0.7948	0.7192	0.6099	0.4740	0.3796	0.4001	0.5660	0.7298	0.8234	0.8671	(86)
MIT	19.1993	19.4196	19.7425	20.2227	20.6146	20.8582	20.9393	20.9296	20.7510	20.2962	19.7082	19.1635	(87)
Th 2	20.2111	20.2131	20.2131	20.2212	20.2192	20.2293	20.2334	20.2334	20.2293	20.2212	20.2212	20.2192	(88)
util rest of house													
	0.8473	0.8197	0.7771	0.6939	0.5729	0.4238	0.3200	0.3396	0.5196	0.7011	0.8062	0.8555	(89)
MIT 2	18.1048	18.3794	18.7791	19.3712	19.8320	20.1076	20.1905	20.1826	19.9981	19.4687	18.7499	18.0657	(90)
Living area fraction										fLA = Living area / (4) =		0.3912	(91)
MIT	18.5330	18.7863	19.1561	19.7044	20.1382	20.4013	20.4834	20.4749	20.2926	19.7924	19.1248	18.4952	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.5330	18.7863	19.1561	19.7044	20.1382	20.4013	20.4834	20.4749	20.2926	19.7924	19.1248	18.4952	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8163	0.7898	0.7501	0.6757	0.5689	0.4353	0.3399	0.3591	0.5236	0.6837	0.7783	0.8248	(94)
Useful gains	346.5818	356.6854	353.3681	324.2072	271.0491	200.6447	149.1706	151.6757	218.7827	277.5852	312.1311	339.3494	(95)
Ext temp.	4.7000	5.3000	6.7000	9.3000	12.3000	15.0000	16.6000	16.5000	14.1000	10.8000	7.5000	4.6000	(96)
Heat loss rate W													
	573.9160	557.9816	515.3548	425.6867	321.5923	218.5066	156.2101	159.8883	250.5195	367.9182	475.6188	570.1084	(97)
Space heating kWh													
	169.1367	135.2710	120.5180	73.0652	37.6041	0.0000	0.0000	0.0000	0.0000	67.2077	117.7111	171.6847	(98a)
Space heating requirement - total per year (kWh/year)												892.1987	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	

Space heating kWh

169.1367	135.2710	120.5180	73.0652	37.6041	0.0000	0.0000	0.0000	0.0000	67.2077	117.7111	171.6847	(98c)

Space heating requirement after solar contribution - total per year (kWh/year) 892.1987

Space heating per m2 (98c) / (4) = 18.2566 (99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (201)
Fraction of space heat from main system(s) 1.0000 (202)
Fraction of main heating from main system 2 0.0000 (203)
Fraction of total heating from main system 1 1.0000 (204)
Fraction of total heating from main system 2 0.0000 (205)
Efficiency of main space heating system 1 (in %) 100.0000 (206)
Efficiency of main space heating system 2 (in %) 0.0000 (207)
Efficiency of secondary/supplementary heating system, % 0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	169.1367	135.2710	120.5180	73.0652	37.6041	0.0000	0.0000	0.0000	0.0000	67.2077	117.7111	171.6847	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000		(210)
Space heating fuel (main heating system)													
	169.1367	135.2710	120.5180	73.0652	37.6041	0.0000	0.0000	0.0000	0.0000	67.2077	117.7111	171.6847	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement													
	194.9612	172.1797	182.2779	158.6865	152.7661	136.4987	133.8510	139.7965	142.0329	159.7690	171.5936	192.6210	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month													
	60.0768	53.0567	56.1685	48.8988	47.0745	42.0617	41.2458	43.0779	43.7671	49.2324	52.8761	59.3557	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	15.6682	14.1519	15.6682	15.1628	15.6682	15.1628	15.6682	15.6682	15.1628	15.6682	15.1628	15.6682	(231)
Lighting	16.7415	13.4307	12.0928	8.8597	6.8435	5.5912	6.2429	8.1147	10.5402	13.8293	15.6202	17.2068	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year
Space heating fuel - main system 1 892.1987 (211)
Space heating fuel - main system 2 0.0000 (213)
Space heating fuel - secondary 0.0000 (215)
Efficiency of water heater 324.5200
Water heating fuel used 596.8921 (219)
Space cooling fuel 0.0000 (221)

Electricity for pumps and fans:
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.2180)
mechanical ventilation fans (SFP = 1.2180) 184.4804 (230a)
Total electricity for the above, kWh/year 184.4804 (231)
Electricity for lighting (calculated in Appendix L) 135.1135 (232)

Energy saving/generation technologies (Appendices M ,N and Q)
PV generation 0.0000 (233)
Wind generation 0.0000 (234)
Hydro-electric generation (Appendix N) 0.0000 (235a)
Electricity generated - Micro CHP (Appendix N) 0.0000 (235)
Appendix Q - special features
Energy saved or generated -0.0000 (236)
Energy used 0.0000 (237)
Total delivered energy for all uses 1808.6847 (238)

10a. Fuel costs - using BEDF prices (583)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	892.1987	28.4300	253.6521	(240)
Space heating - main system 2	0.0000	28.4300	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	596.8921	28.4300	169.6964	(247)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(247a)
Pumps, fans and electric keep-hot	184.4804	28.4300	52.4478	(249)
Energy for lighting	135.1135	28.4300	38.4128	(250)
Additional standing charges			0.0000	(251)
Total energy cost			514.2091	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	892.1987	0.1546	137.9632	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)

Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	596.8921	0.1411	84.2266 (264)
Space and water heating			222.1898 (265)
Pumps, fans and electric keep-hot	184.4804	0.1387	25.5897 (267)
Energy for lighting	135.1135	0.1443	19.5011 (268)
Total CO2, kg/year			267.2806 (272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	892.1987	1.5725	1402.9798	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	596.8921	1.5218	908.3378	(278)
Space and water heating			2311.3176	(279)
Pumps, fans and electric keep-hot	184.4804	1.5128	279.0820	(281)
Energy for lighting	135.1135	1.5338	207.2416	(282)
Total Primary energy kWh/year			2797.6412	(286)

SAP 10 EPC IMPROVEMENTS

001

Current energy efficiency rating: B 81
Current environmental impact rating: A 96

N Solar water heating	Not applicable
U Solar photovoltaic panels	Not applicable
V2 Wind turbine	Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
(none)			

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: B 81
Potential environmental impact rating: A 96

Fuel prices for cost data on this page from database revision number 583 TEST (01 Oct 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, West Pennines (England)):

	Current	Potential	Saving
Electricity	£514	£514	£0
Space heating	£306	£306	£0
Water heating	£170	£170	£0
Lighting	£38	£38	£0
Total cost of fuels	£514	£514	£0
Total cost of uses	£514	£514	£0
Delivered energy	37 kWh/m²	37 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.3 tonnes	0.3 tonnes	0.0 tonnes
CO2 emissions per m²	5 kg/m²	5 kg/m²	0 kg/m²
Primary energy	57 kWh/m²	57 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	3.0200 (1b)	x	2.8500 (2b)	=	8.6070	(1b) - (3b)
First floor	45.8500 (1c)	x	2.5200 (2c)	=	115.5420	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	48.8700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	124.1490	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)

Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		2.6400 (17)
Infiltration rate		0.1320 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1122 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1431	0.1403	0.1374	0.1234	0.1206	0.1066	0.1066	0.1038	0.1122	0.1206	0.1262	0.1318	(22b)

Balanced mechanical ventilation with heat recovery		
If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =		80.1000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2426	0.2397	0.2369	0.2229	0.2201	0.2061	0.2061	0.2033	0.2117	0.2201	0.2257	0.2313	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Door			2.1500	0.7800	1.6770			(26)
Window			5.7300	0.7282	4.1723			(27)
GF			3.0200	0.0900	0.2718	75.0000	226.5000	(28a)
Exposed Floor			1.6100	0.1400	0.2254	20.0000	32.2000	(28b)
Main	67.2921	7.8800	59.4121	0.1300	7.7236	9.0000	534.7089	(29a)
PIJ	45.8500		45.8500	0.1100	5.0435	9.0000	412.6500	(30)
Flat	3.0200		3.0200	0.1200	0.3624	9.0000	27.1800	(30)
Total net area of external elements Aum(A, m2)			120.7921					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.4760			(33)
Main dwelling								
Party Wall 1			26.6500	0.0000	0.0000	20.0000	533.0000	(32)
Party Floor 1			37.9700			30.0000	1139.1000	(32d)
Timber			50.4000			9.0000	453.6000	(32c)
Internal Floor 1			6.2700			18.0000	112.8600	(32d)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	3471.7989 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		71.0415 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	5.8000	0.1150	0.6670
E3 Sill	5.8000	0.0170	0.0986
E4 Jamb	16.2000	0.0940	1.5228
E5 Ground floor (normal)	2.0100	0.0670	0.1347
E7 Party floor between dwellings (in blocks of flats)	21.8500	0.0320	0.6992
E16 Corner (normal)	10.0800	0.0680	0.6854
E17 Corner (inverted - internal area greater than external area)	5.0400	-0.0290	-0.1462
P1 Party wall - Ground floor	5.1000	0.0560	0.2856
E18 Party wall between dwellings	11.4000	0.2400	2.7360
E25 Staggered party wall between dwellings	5.0400	0.0560	0.2822
E20 Exposed floor (normal)	1.2700	0.3200	0.4064
E21 Exposed floor (inverted)	3.8100	0.3200	1.2192
E6 Intermediate floor within a dwelling	2.5800	0.0320	0.0826
E10 Eaves (insulation at ceiling level)	15.9700	0.0420	0.6707
E12 Gable (insulation at ceiling level)	8.4600	0.0770	0.6514
E14 Flat roof	2.0100	0.2050	0.4120
E24 Eaves (insulation at ceiling level - inverted)	2.0100	0.1500	0.3015
P4 Party wall - Roof (insulation at ceiling level)	4.9100	0.1020	0.5008
P5 Party wall - Roof (insulation at rafter level)	3.0000	0.4800	1.4400

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		12.6501 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	32.1261 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	9.9373	9.8224	9.7074	9.1328	9.0179	8.4433	8.4433	8.3284	8.6732	9.0179	9.2478	9.4776	(38)
Heat transfer coeff	42.0634	41.9484	41.8335	41.2589	41.1440	40.5694	40.5694	40.4545	40.7993	41.1440	41.3738	41.6037	(39)
Average = Sum(39)m / 12 =												41.2302	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8607	0.8584	0.8560	0.8443	0.8419	0.8301	0.8301	0.8278	0.8349	0.8419	0.8466	0.8513	(40)
HLP (average)												0.8437	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		1.6569 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
52.0000	51.2186	50.0798	47.9010	46.2932	44.5001	43.4809	44.6110	45.8498	47.7751	50.0006	51.8008	(42a)

Hot water usage for baths

22.4849	22.1510	21.6808	20.8137	20.1645	19.4446	19.0557	19.5227	20.0311	20.8014	21.6863	22.4089	(42b)

Hot water usage for other uses

31.5982	30.4492	29.3001	28.1511	27.0021	25.8531	25.8531	27.0021	28.1511	29.3001	30.4492	31.5982	(42c)

Average daily hot water use (litres/day)		97.5150 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	106.0831	103.8187	101.0607	96.8659	93.4597	89.7977	88.3896	91.1358	94.0320	97.8766	102.1361	105.8079	(44)
Energy conte	168.0098	147.8365	155.3265	132.6045	125.8147	110.4167	106.8996	112.8451	115.9509	132.8176	145.5116	165.6696	(45)
Energy content (annual)										Total = Sum(45)m =		1619.7032	

Distribution loss (46)m = 0.15 x (45)m

25.2015	22.1755	23.2990	19.8907	18.8722	16.5625	16.0349	16.9268	17.3926	19.9226	21.8267	24.8504	(46)

Water storage loss:

Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8694	(55)
Total storage loss													
	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage													
	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	194.9612	172.1797	182.2779	158.6865	152.7661	136.4987	133.8510	139.7965	142.0329	159.7690	171.5936	192.6210	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	194.9612	172.1797	182.2779	158.6865	152.7661	136.4987	133.8510	139.7965	142.0329	159.7690	171.5936	192.6210	(64)
										Total per year (kWh/year) = Sum(64)m =		1937.0342	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000	(64a)
Heat gains from water heating, kWh/month													
	55.8632	49.1556	51.6461	44.0910	41.8334	36.7136	35.5441	37.5210	38.5537	44.1619	48.3826	55.0851	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	99.4132	99.4132	99.4132	99.4132	99.4132	99.4132	99.4132	99.4132	99.4132	99.4132	99.4132	99.4132	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	19.1267	16.9882	13.8157	10.4594	7.8185	6.6007	7.1323	9.2708	12.4433	15.7996	18.4405	19.6583	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	215.3723	217.6072	211.9753	199.9858	184.8511	170.6267	161.1239	158.8890	164.5209	176.5104	191.6451	205.8695	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	46.5982	46.5982	46.5982	46.5982	46.5982	46.5982	46.5982	46.5982	46.5982	46.5982	46.5982	46.5982	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	(71)
Water heating gains (Table 5)													
	75.0850	73.1483	69.4168	61.2375	56.2277	50.9911	47.7744	50.4314	53.5468	59.3573	67.1981	74.0392	(72)
Total internal gains													
	389.3200	387.4796	374.9438	351.4186	328.6333	307.9544	295.7665	298.3273	310.2469	331.4033	357.0196	379.3029	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	2.8600	10.6334	0.3800	0.0000	0.7700	8.8984	(74)
South	2.0500	46.7521	0.3800	0.0000	0.7700	28.0433	(78)
West	0.8200	19.6403	0.3800	0.0000	0.7700	4.7123	(80)

Solar gains	41.6540	72.1513	102.5811	134.6775	158.5625	161.0216	153.7257	135.2141	113.5130	80.7182	50.0939	35.5253	(83)
Total gains	430.9740	459.6309	477.5249	486.0961	487.1958	468.9760	449.4922	433.5414	423.7599	412.1216	407.1135	414.8282	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	22.9270	22.9899	23.0530	23.3741	23.4393	23.7713	23.7713	23.8388	23.6374	23.4393	23.3091	23.1804	
alpha	2.5285	2.5327	2.5369	2.5583	2.5626	2.5848	2.5848	2.5893	2.5758	2.5626	2.5539	2.5454	
util living area													
	0.8632	0.8378	0.7969	0.7285	0.6281	0.4927	0.3743	0.4004	0.5631	0.7327	0.8290	0.8722	(86)
MIT	19.0997	19.3287	19.6970	20.1588	20.5554	20.8333	20.9401	20.9270	20.7503	20.2691	19.6244	19.0523	(87)
Th 2	20.2010	20.2030	20.2050	20.2151	20.2172	20.2273	20.2273	20.2293	20.2232	20.2172	20.2131	20.2091	(88)
util rest of house													
	0.8514	0.8241	0.7793	0.7043	0.5937	0.4448	0.3149	0.3409	0.5165	0.7045	0.8126	0.8611	(89)
MIT 2	17.9731	18.2589	18.7171	19.2891	19.7614	20.0796	20.1852	20.1760	19.9918	19.4328	18.6400	17.9196	(90)
Living area fraction										fLA = Living area / (4) =		0.3912	(91)
MIT	18.4139	18.6774	19.1005	19.6294	20.0720	20.3745	20.4805	20.4698	20.2886	19.7600	19.0251	18.3628	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.4139	18.6774	19.1005	19.6294	20.0720	20.3745	20.4805	20.4698	20.2886	19.7600	19.0251	18.3628	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8199	0.7934	0.7517	0.6846	0.5869	0.4542	0.3348	0.3599	0.5206	0.6865	0.7838	0.8298	(94)
Useful gains	353.3502	364.6787	358.9728	332.7727	285.9323	213.0049	150.4744	156.0530	220.5931	282.9069	319.0759	344.2287	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	593.6772	577.9418	527.1234	442.6831	344.4594	234.2669	157.4304	164.6434	252.4883	376.8784	493.3892	589.2246	(97)
Space heating kWh													
	178.8033	143.3128	125.1040	79.1355	43.5442	0.0000	0.0000	0.0000	0.0000	69.9148	125.5056	182.2769	(98a)
Space heating requirement - total per year (kWh/year)												947.5971	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	178.8033	143.3128	125.1040	79.1355	43.5442	0.0000	0.0000	0.0000	0.0000	69.9148	125.5056	182.2769	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												947.5971	
Space heating per m2											(98c) / (4) =	19.3902	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Fraction of main heating from main system 2												0.0000	(203)
Fraction of total heating from main system 1												1.0000	(204)
Fraction of total heating from main system 2												0.0000	(205)
Efficiency of main space heating system 1 (in %)												100.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	178.8033	143.3128	125.1040	79.1355	43.5442	0.0000	0.0000	0.0000	0.0000	69.9148	125.5056	182.2769	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	178.8033	143.3128	125.1040	79.1355	43.5442	0.0000	0.0000	0.0000	0.0000	69.9148	125.5056	182.2769	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement													
	194.9612	172.1797	182.2779	158.6865	152.7661	136.4987	133.8510	139.7965	142.0329	159.7690	171.5936	192.6210	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month													
	60.0768	53.0567	56.1685	48.8988	47.0745	42.0617	41.2458	43.0779	43.7671	49.2324	52.8761	59.3557	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	15.6682	14.1519	15.6682	15.1628	15.6682	15.1628	15.6682	15.6682	15.1628	15.6682	15.1628	15.6682	(231)
Lighting	16.7415	13.4307	12.0928	8.8597	6.8435	5.5912	6.2429	8.1147	10.5402	13.8293	15.6202	17.2068	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												947.5971	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												324.5200	
Water heating fuel used												596.8921	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.2180)													
mechanical ventilation fans (SFP = 1.2180)												184.4804	(230a)
Total electricity for the above, kWh/year												184.4804	(231)
Electricity for lighting (calculated in Appendix L)												135.1135	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												1864.0831	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	947.5971	16.4900	156.2588	(240)
Space heating - main system 2	0.0000	16.4900	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	596.8921	16.4900	98.4275	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	184.4804	16.4900	30.4208	(249)
Energy for lighting	135.1135	16.4900	22.2802	(250)
Additional standing charges			0.0000	(251)
Total energy cost			307.3873	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.1789	(257)
SAP value		80.8907	
SAP rating (Section 12)		81	(258)
SAP band		B	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	947.5971	0.1545	146.4510	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	596.8921	0.1411	84.2266	(264)
Space and water heating			230.6776	(265)
Pumps, fans and electric keep-hot	184.4804	0.1387	25.5897	(267)
Energy for lighting	135.1135	0.1443	19.5011	(268)
Total CO2, kg/year			275.7684	(272)
CO2 emissions per m2			5.6400	(273)
EI value			96.0634	
EI rating			96	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	3.0200 (1b)	x	2.8500 (2b)	=	8.6070	(1b) - (3b)
First floor	45.8500 (1c)	x	2.5200 (2c)	=	115.5420	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	48.8700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	124.1490	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.6400	(17)
Infiltration rate		0.1320	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1122	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.6000	4.5000	4.5000	4.1000	4.2000	3.7000	3.5000	3.5000	3.7000	4.1000	4.1000	4.2000	(22)
Wind factor	1.1500	1.1250	1.1250	1.0250	1.0500	0.9250	0.8750	0.8750	0.9250	1.0250	1.0250	1.0500	(22a)
Adj infilt rate	0.1290	0.1262	0.1262	0.1150	0.1178	0.1038	0.0982	0.0982	0.1038	0.1150	0.1150	0.1178	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	80.1000 (23c)

Effective ac	0.2285	0.2257	0.2257	0.2145	0.2173	0.2033	0.1977	0.1977	0.2033	0.2145	0.2145	0.2173	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door			2.1500	0.7800	1.6770			(26)
Window			5.7300	0.7282	4.1723			(27)
GF			3.0200	0.0900	0.2718	75.0000	226.5000	(28a)
Exposed Floor			1.6100	0.1400	0.2254	20.0000	32.2000	(28b)
Main	67.2921	7.8800	59.4121	0.1300	7.7236	9.0000	534.7089	(29a)
PIJ	45.8500		45.8500	0.1100	5.0435	9.0000	412.6500	(30)
Flat	3.0200		3.0200	0.1200	0.3624	9.0000	27.1800	(30)
Total net area of external elements Aum(A, m2)			120.7921					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.4760			(33)
Main dwelling								
Party Wall 1			26.6500	0.0000	0.0000	20.0000	533.0000	(32)
Party Floor 1			37.9700			30.0000	1139.1000	(32d)
Timber			50.4000			9.0000	453.6000	(32c)
Internal Floor 1			6.2700			18.0000	112.8600	(32d)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	3471.7989 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		71.0415 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	5.8000	0.1150	0.6670
E3 Sill	5.8000	0.0170	0.0986
E4 Jamb	16.2000	0.0940	1.5228

E5 Ground floor (normal)	2.0100	0.0670	0.1347	
E7 Party floor between dwellings (in blocks of flats)	21.8500	0.0320	0.6992	
E16 Corner (normal)	10.0800	0.0680	0.6854	
E17 Corner (inverted - internal area greater than external area)	5.0400	-0.0290	-0.1462	
P1 Party wall - Ground floor	5.1000	0.0560	0.2856	
E18 Party wall between dwellings	11.4000	0.2400	2.7360	
E25 Staggered party wall between dwellings	5.0400	0.0560	0.2822	
E20 Exposed floor (normal)	1.2700	0.3200	0.4064	
E21 Exposed floor (inverted)	3.8100	0.3200	1.2192	
E6 Intermediate floor within a dwelling	2.5800	0.0320	0.0826	
E10 Eaves (insulation at ceiling level)	15.9700	0.0420	0.6707	
E12 Gable (insulation at ceiling level)	8.4600	0.0770	0.6514	
E14 Flat roof	2.0100	0.2050	0.4120	
E24 Eaves (insulation at ceiling level - inverted)	2.0100	0.1500	0.3015	
P4 Party wall - Roof (insulation at ceiling level)	4.9100	0.1020	0.5008	
P5 Party wall - Roof (insulation at rafter level)	3.0000	0.4800	1.4400	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 12.6501 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 32.1261 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	9.3627	9.2478	9.2478	8.7881	8.9030	8.3284	8.0986	8.0986	8.3284	8.7881	8.7881	8.9030	(38)
Heat transfer coeff	41.4888	41.3738	41.3738	40.9142	41.0291	40.4545	40.2247	40.2247	40.4545	40.9142	40.9142	41.0291	(39)

Average = Sum(39)m / 12 = 40.8663

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8490	0.8466	0.8466	0.8372	0.8396	0.8278	0.8231	0.8231	0.8278	0.8372	0.8372	0.8396	(40)
HLP (average)												0.8362	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.6569 (42)

Hot water usage for mixer showers

52.0000	51.2186	50.0798	47.9010	46.2932	44.5001	43.4809	44.6110	45.8498	47.7751	50.0006	51.8008	(42a)

Hot water usage for baths

22.4849	22.1510	21.6808	20.8137	20.1645	19.4446	19.0557	19.5227	20.0311	20.8014	21.6863	22.4089	(42b)

Hot water usage for other uses

31.5982	30.4492	29.3001	28.1511	27.0021	25.8531	25.8531	27.0021	28.1511	29.3001	30.4492	31.5982	(42c)

Average daily hot water use (litres/day) 97.5150 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	106.0831	103.8187	101.0607	96.8659	93.4597	89.7977	88.3896	91.1358	94.0320	97.8766	102.1361	105.8079	(44)
Energy conte	168.0098	147.8365	155.3265	132.6045	125.8147	110.4167	106.8996	112.8451	115.9509	132.8176	145.5116	165.6696	(45)
Energy content (annual)										Total = Sum(45)m =		1619.7032	
Distribution loss (46)m = 0.15 x (45)m	25.2015	22.1755	23.2990	19.8907	18.8722	16.5625	16.0349	16.9268	17.3926	19.9226	21.8267	24.8504	(46)

Water storage loss:

Store volume 200.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.6100 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.8694 (55)

Total storage loss

26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)

If cylinder contains dedicated solar storage

26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

194.9612	172.1797	182.2779	158.6865	152.7661	136.4987	133.8510	139.7965	142.0329	159.7690	171.5936	192.6210	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

194.9612	172.1797	182.2779	158.6865	152.7661	136.4987	133.8510	139.7965	142.0329	159.7690	171.5936	192.6210	(64)
									Total per year (kWh/year) = Sum(64)m =		1937.0342	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)

Heat gains from water heating, kWh/month

55.8632	49.1556	51.6461	44.0910	41.8334	36.7136	35.5441	37.5210	38.5537	44.1619	48.3826	55.0851	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	99.4132	99.4132	99.4132	99.4132	99.4132	99.4132	99.4132	99.4132	99.4132	99.4132	99.4132	99.4132	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	19.1267	16.9882	13.8157	10.4594	7.8185	6.6007	7.1323	9.2708	12.4433	15.7996	18.4405	19.6583	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	215.3723	217.6072	211.9753	199.9858	184.8511	170.6267	161.1239	158.8890	164.5209	176.5104	191.6451	205.8695	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	46.5982	46.5982	46.5982	46.5982	46.5982	46.5982	46.5982	46.5982	46.5982	46.5982	46.5982	46.5982	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)	
Losses e.g. evaporation (negative values) (Table 5)	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	(71)
Water heating gains (Table 5)	75.0850	73.1483	69.4168	61.2375	56.2277	50.9911	47.7744	50.4314	53.5468	59.3573	67.1981	74.0392	(72)
Total internal gains	389.3200	387.4796	374.9438	351.4186	328.6333	307.9544	295.7665	298.3273	310.2469	331.4033	357.0196	379.3029	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W

North				2.8600		8.9975		0.3800		0.0000		0.7700	7.5294 (74)
South				2.0500		39.5594		0.3800		0.0000		0.7700	23.7289 (78)
West				0.8200		16.6187		0.3800		0.0000		0.7700	3.9874 (80)
Solar gains	35.2457	64.1345	96.1698	128.3926	147.8265	152.9705	143.1520	124.0180	107.5906	74.6032	44.0219	32.1420 (83)	
Total gains	424.5657	451.6141	471.1136	479.8112	476.4598	460.9249	438.9185	422.3453	417.8375	406.0065	401.0415	411.4449 (84)	

7. Mean internal temperature (heating season)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
tau	23.2446	23.3091	23.3091	23.5710	23.5050	23.8388	23.9751	23.9751	23.8388	23.5710	23.5710	23.5050	
alpha	2.5496	2.5539	2.5539	2.5714	2.5670	2.5893	2.5983	2.5983	2.5893	2.5714	2.5714	2.5670	
util living area	0.8595	0.8339	0.7948	0.7192	0.6099	0.4740	0.3796	0.4001	0.5660	0.7298	0.8234	0.8671	(86)
MIT	19.1993	19.4196	19.7425	20.2227	20.6146	20.8582	20.9393	20.9296	20.7510	20.2962	19.7082	19.1635	(87)
Th 2	20.2111	20.2131	20.2131	20.2212	20.2192	20.2293	20.2334	20.2334	20.2293	20.2212	20.2212	20.2192	(88)
util rest of house	0.8473	0.8197	0.7771	0.6939	0.5729	0.4238	0.3200	0.3396	0.5196	0.7011	0.8062	0.8555	(89)
MIT 2	18.1048	18.3794	18.7791	19.3712	19.8320	20.1076	20.1905	20.1826	19.9981	19.4687	18.7499	18.0657	(90)
Living area fraction										fLA = Living area / (4) =		0.3912	(91)
MIT	18.5330	18.7863	19.1561	19.7044	20.1382	20.4013	20.4834	20.4749	20.2926	19.7924	19.1248	18.4952	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.5330	18.7863	19.1561	19.7044	20.1382	20.4013	20.4834	20.4749	20.2926	19.7924	19.1248	18.4952	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8163	0.7898	0.7501	0.6757	0.5689	0.4353	0.3399	0.3591	0.5236	0.6837	0.7783	0.8248	(94)
Useful gains	346.5818	356.6854	353.3681	324.2072	271.0491	200.6447	149.1706	151.6757	218.7827	277.5852	312.1311	339.3494	(95)
Ext temp.	4.7000	5.3000	6.7000	9.3000	12.3000	15.0000	16.6000	16.5000	14.1000	10.8000	7.5000	4.6000	(96)
Heat loss rate W	573.9160	557.9816	515.3548	425.6867	321.5923	218.5066	156.2101	159.8883	250.5195	367.9182	475.6188	570.1084	(97)
Space heating kWh	169.1367	135.2710	120.5180	73.0652	37.6041	0.0000	0.0000	0.0000	0.0000	67.2077	117.7111	171.6847	(98a)
Space heating requirement - total per year (kWh/year)												892.1987	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	169.1367	135.2710	120.5180	73.0652	37.6041	0.0000	0.0000	0.0000	0.0000	67.2077	117.7111	171.6847	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												892.1987	
Space heating per m2											(98c) / (4) =	18.2566	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Fraction of main heating from main system 2												0.0000	(203)
Fraction of total heating from main system 1												1.0000	(204)
Fraction of total heating from main system 2												0.0000	(205)
Efficiency of main space heating system 1 (in %)												100.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	169.1367	135.2710	120.5180	73.0652	37.6041	0.0000	0.0000	0.0000	0.0000	67.2077	117.7111	171.6847	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	169.1367	135.2710	120.5180	73.0652	37.6041	0.0000	0.0000	0.0000	0.0000	67.2077	117.7111	171.6847	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	194.9612	172.1797	182.2779	158.6865	152.7661	136.4987	133.8510	139.7965	142.0329	159.7690	171.5936	192.6210	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month	60.0768	53.0567	56.1685	48.8988	47.0745	42.0617	41.2458	43.0779	43.7671	49.2324	52.8761	59.3557	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	15.6682	14.1519	15.6682	15.1628	15.6682	15.1628	15.6682	15.6682	15.1628	15.6682	15.1628	15.6682	(231)
Lighting	16.7415	13.4307	12.0928	8.8597	6.8435	5.5912	6.2429	8.1147	10.5402	13.8293	15.6202	17.2068	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												892.1987	(211)

Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	324.5200	
Water heating fuel used	596.8921	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.2180)		
mechanical ventilation fans (SFP = 1.2180)	184.4804	(230a)
Total electricity for the above, kWh/year	184.4804	(231)
Electricity for lighting (calculated in Appendix L)	135.1135	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	1808.6847	(238)

10a. Fuel costs - using BEDF prices (583)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	892.1987	28.4300	253.6521	(240)
Space heating - main system 2	0.0000	28.4300	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	596.8921	28.4300	169.6964	(247)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(247a)
Pumps, fans and electric keep-hot	184.4804	28.4300	52.4478	(249)
Energy for lighting	135.1135	28.4300	38.4128	(250)
Additional standing charges			0.0000	(251)
Total energy cost			514.2091	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	892.1987	0.1546	137.9632	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	596.8921	0.1411	84.2266	(264)
Space and water heating			222.1898	(265)
Pumps, fans and electric keep-hot	184.4804	0.1387	25.5897	(267)
Energy for lighting	135.1135	0.1443	19.5011	(268)
Total CO2, kg/year			267.2806	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	892.1987	1.5725	1402.9798	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	596.8921	1.5218	908.3378	(278)
Space and water heating			2311.3176	(279)
Pumps, fans and electric keep-hot	184.4804	1.5128	279.0820	(281)
Energy for lighting	135.1135	1.5338	207.2416	(282)
Total Primary energy kWh/year			2797.6412	(286)

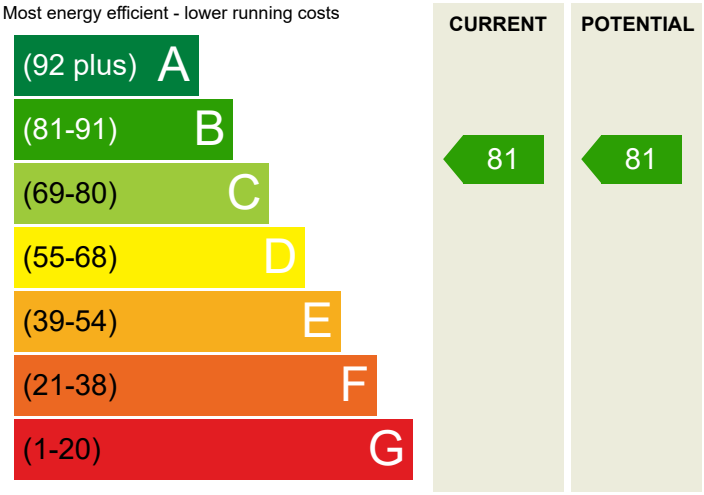
Energy Report

Dwelling Address	10 Shepherd Street, MANCHESTER, M9 4QW
Reference	78449-20-001
Assessment Date	02/07/2025
Submission Date	18/08/2025
Property Type	Flat, End-Terrace
Total Floor Area	49

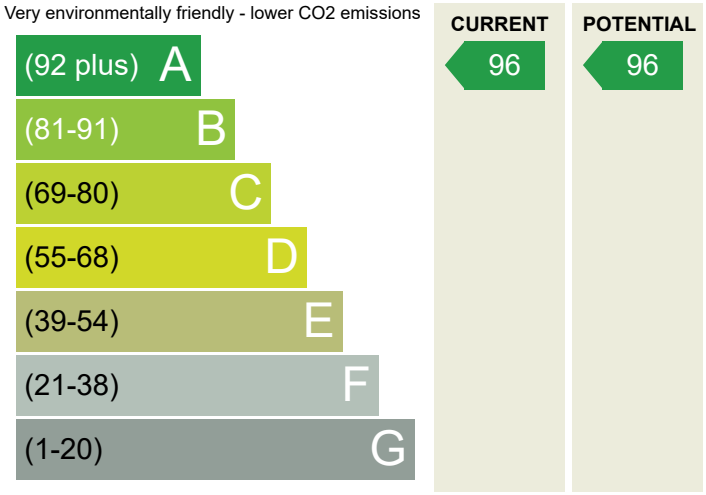
This Energy Report has been generated using the UK's National Calculation Methodology for dwellings, Standard Assessment Procedure (SAP). This methodology is used to assess the energy efficiency of dwellings which is calculated based on a dwelling's heating, hot water, ventilation and lighting usage.

This document is not an Energy Performance Certificate (EPC) as required by the Energy Performance of Buildings Regulations

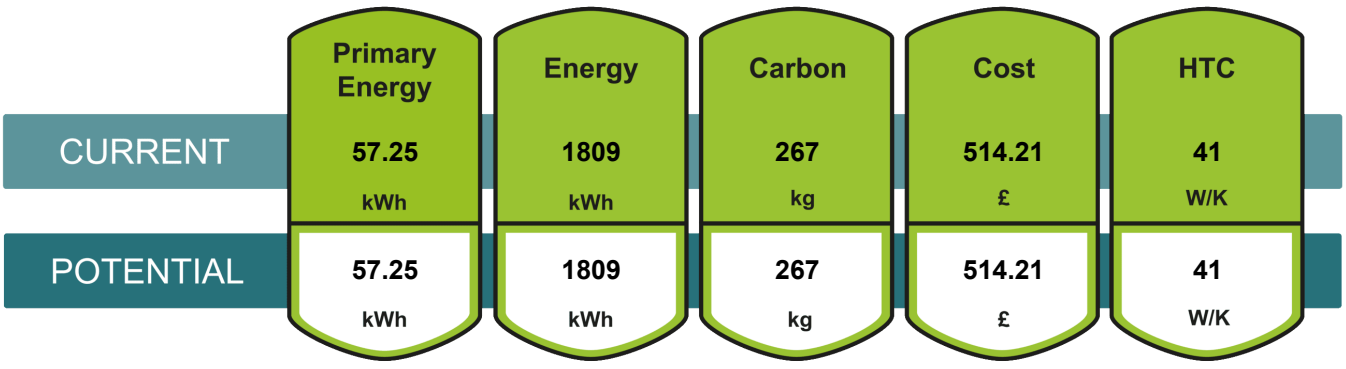
Energy Efficiency Rating



Carbon Dioxide (CO2) Emissions Rating



Additional ratings for your home



Energy Report

Breakdown of property's energy performance

Each feature is assessed as one of the following:

Very Poor	Poor	Average	Good	Very Good

Feature	Description	Energy Performance
Walls	Average thermal transmittance 0.13 W/m²K	Very Good
Roof	Average thermal transmittance 0.11 W/m²K	Very Good
Floor	Average thermal transmittance 0.11 W/m²K	Very Good
Windows	High performance glazing	Very Good
Main heating	Room heaters, electric	Very Poor
Main heating controls	Programmer and room thermostat	Good
Secondary heating	None	
Hot water	From main system	Very Good
Lighting	Good lighting efficiency	Good
Air tightness	Air permeability [AP50] = 2.6 m³/h.m² (as tested)	Very Good

Recommendations

The recommended measures provided below will help to improve the energy efficiency of the dwelling.
To reach the dwelling's potential energy rating all of the recommended measures shown below would need to be installed.
Having these measures installed individually or in any other order may give a different result when compared with the cumulative potential rating.

Recommended measures	Cumulative savings (per year)	Cumulative rating	Typical costs	Incremental savings (per year)	Cumulative CO2 rating

The typical cost is based on average installation prices across the country so may not be representative of the actual costs in your area.

Estimated energy costs of the dwelling

Energy Report

The table below shows the estimated running costs of the space and water heating and lighting within the dwelling. It does not include the energy used from household appliances. The estimated annual costs after potential improvements indicates the total energy cost if all recommended measures named above were installed.

	Estimated annual costs	Estimated annual costs after potential improvements	Potential future savings
Lighting	£38	£38	
Heating	£306	£306	
Hot Water	£170	£170	
New Technologies e.g. Impact of PV	£0	£0	
TOTAL	£514	£514	

Estimated energy use and potential savings

Space Heating
892
kWh per year

Water Heating
597
kWh per year

About this document

Created by:	
Company/Trading name:	
Phone number:	
Email address:	

Disclaimer

This Energy Report should not under any circumstances be treated as a Condition Survey and cannot be used to indicate that any element of the dwelling (e.g.heating system) is working correctly.
This Energy Report must not be used in situations where an Energy Performance Certificate (EPC) is required.
This Energy Report is generated from a set of data inputs which may not reflect the actual dimensions, services or construction of the dwelling.
The calculation used to generate this report reflects the SAP Methodology current at the time of report generation.

Glossary terms for additional metrics

Primary Energy	The measure of the energy required for lighting, heating and hot water in a property. This includes the efficiency of the property's heating system, power station efficiency for electricity and the energy used to produce the fuel and deliver it to the property.
Energy Used	The estimated amount of fuel energy for lighting, heating and hot water for the property. The estimate is based on typical usage which is likely to be different to actual consumption.
Carbon (CO2)	The current emissions based on the energy estimates.
Cost	The estimated cost of energy. The cost of each unit of fuel is based on an industry standard which is likely to be different to those the occupier actually pays.
Heat Transfer Coefficient	Heat flow through the property envelope where internal and external temperatures are different.

Building Regulations England Part L (BREL) Compliance Report

Approved Document L1 2021 Edition, England assessed by Array SAP 10 program, Array

Date: Fri 03 Oct 2025 15:03:30

Project Information			
Assessed By	Paul Goddard	Building Type	Flat, Mid-terrace
OCDEA Registration	EES/005113	Assessment Date	2025-10-03

Dwelling Details			
Assessment Type	As built	Total Floor Area	38 m^2
Site Reference	78449-21	Plot Reference	001
Address	8 Shepherd Street, MANCHESTER, M9 4QW		

Client Details	
Name	-
Company	John Southworth
Address	Unit 10, Charles Street, DUKINFIELD, SK16 4SD

This report covers items included within the SAP calculations. It is not a complete report of regulations compliance.

1a Target emission rate and dwelling emission rate		
Fuel for main heating system	Electricity	
Target carbon dioxide emission rate	*15.88 $kgCO_2/m^2$*	
Dwelling carbon dioxide emission rate	4.13 $kgCO_2/m^2$	OK
1b Target primary energy rate and dwelling primary energy		
Target primary energy	*84.09 kWh_{PE}/m^2*	
Dwelling primary energy	43.65 kWh_{PE}/m^2	OK
1c Target fabric energy efficiency and dwelling fabric energy efficiency		
Target fabric energy efficiency	*35.7 kWh/m^2*	
Dwelling fabric energy efficiency	24.4 kWh/m^2	OK

2a Fabric U-values				
Element	***Maximum permitted average U-Value [W/m^2K]***	**Dwelling average U-Value [W/m^2K]**	**Element with highest individual U-Value**	
External walls	*0.26*	0.13	Walls (1) (0.13)	OK
Party walls	*0.2*	0	Party Wall (1) (0)	**N/A**
Curtain walls	*1.6*	0	N/A	**N/A**
Floors	*0.18*	0.09	GF (0.09)	OK
Roofs	*0.16*	N/A	N/A	**N/A**
Windows, doors, and roof windows	*1.6*	0.76	Front (0.78)	OK
Rooflights	*2.2*	N/A	N/A	**N/A**

2b Envelope elements (better than typically expected values are flagged with a subsequent (!))		
Name	**Net area [m^2]**	**U-Value [W/m^2K]**
Exposed wall: Walls (1)	32.19	0.13 **(!)**
Party wall: Party Wall (1)	27.22	0 **(!)**
Ground floor: GF, GF	37.97	0.09 **(!)**

2c Openings (better than typically expected values are flagged with a subsequent (!))				
Name	**Area [m^2]**	**Orientation**	**Frame factor**	**U-Value [W/m^2K]**
Front, Door	2.15	South	N/A	0.78 **(!)**
Front, Window	2.81	South	1.0	0.75 **(!)**
Rear, Window	1.66	North	1.0	0.75 **(!)**

2d Thermal bridging (better than typically expected values are flagged with a subsequent (!))				
Building part **1**: Thermal bridging calculated from linear thermal transmittances for each junction				
Main element	**Junction detail**	**Source**	**Psi value [W/mK]**	**Drawing / reference**
External wall	E2: Other lintels (including other steel lintels)	Calculated by person with suitable expertise	0.115	Thermal Bridge Report
External wall	E3: Sill	Calculated by person with suitable expertise	0.017 **(!)**	Thermal Bridge Report
External wall	E4: Jamb	Calculated by person with suitable expertise	0.094	Thermal Bridge Report

Main element	Junction detail	Source	Psi value [W/mK]	Drawing / reference
External wall	E5: Ground floor (normal)	Calculated by person with suitable expertise	0.067	Thermal Bridge Report
External wall	E7: Party floor between dwellings (in blocks of flats)	Calculated by person with suitable expertise	0.032 **(!)**	Thermal Bridge Report
External wall	E16: Corner (normal)	Calculated by person with suitable expertise	0.068	Thermal Bridge Report
External wall	E17: Corner (inverted - internal area greater than external area)	Calculated by person with suitable expertise	-0.029 **(!)**	Thermal Bridge Report
Party wall	P1: Ground floor	Calculated by person with suitable expertise	0.056	Thermal Bridge Report
External wall	E18: Party wall between dwellings	SAP table default	0.24	Thermal Bridge Report
External wall	E25: Staggered party wall between dwellings	Calculated by person with suitable expertise	0.056	Thermal Bridge Report

3 Air permeability (better than typically expected values are flagged with a subsequent (!))		
Maximum permitted air permeability at 50Pa	*8 m^3/hm^2*	
Dwelling air permeability at 50Pa	2.34 m^3/hm^2, Measured value **(!)**	OK
Air permeability test certificate reference		

4 Space heating	
Main heating system 1: Room heaters - Electricity	
Efficiency	100.0%
Emitter type	
Flow temperature	
System type	Panel, convector or radiant heaters
Manufacturer	
Model	
Commissioning	
Main heating system 2: Heat pump with radiators or underfloor heating - Electricity	
Efficiency	0.0%
Emitter type	
Flow temperature	
System type	
Manufacturer	Vaillant Group UK Ltd
Model	aroSTOR 200ltr
Commissioning	
Secondary heating system: N/A	
Fuel	N/A
Efficiency	N/A
Commissioning	

5 Hot water	
Cylinder/store - type: N/A	
Capacity	N/A
Declared heat loss	N/A
Primary pipework insulated	N/A
Manufacturer	
Model	
Commissioning	
Waste water heat recovery system 1 - type: N/A	
Efficiency	
Manufacturer	
Model	

6 Controls	
Main heating 1 - type: Programmer and room thermostats	
Function	
Ecodesign class	
Manufacturer	
Model	

Main heating 2 - type: Not applicable		
Function		
Ecodesign class		
Manufacturer		
Model		
Water heating - type: Cylinder thermostat and HW separately timed		
Manufacturer		
Model		

7 Lighting		
Minimum permitted light source efficacy	*75 lm/W*	
Lowest light source efficacy	75 lm/W	**OK**
External lights control	N/A	

8 Mechanical ventilation		
System type: Balanced whole-house mechanical ventilation with heat recovery		
Maximum permitted specific fan power	*1.5 W/(l/s)*	
Specific fan power	0.87 W/(l/s)	**OK**
Minimum permitted heat recovery efficiency	*73%*	
Heat recovery efficiency	89%	**OK**
Manufacturer/Model	DV96 Adroit	
Commissioning		

9 Local generation
N/A

10 Heat networks
N/A

11 Supporting documentary evidence	
Documentary evidence identified in 11.1 and 11.2 is needed to confirm the data values used for any calculations undertaken, manufacturer declarations made, and tests performed as reflected in this "As built" BREL Compliance Report are correct. 11.1 SAP Conventions, Appendix 1 (documentary evidence) schedules the minimum documentary evidence required. 11.2 Indicative photographic evidence of key stages during construction (guidance within Approved Document L, Volume 1 – Appendix B) that confirms the products identified in this BREL Compliance Report are used in this dwelling, and workmanship is of sufficient quality to support the calculated values claimed in 2a to 2d.	

12 Declarations	
a. Assessor Declaration	
This declaration by the assessor is confirmation that the contents of this BREL Compliance Report are a true and accurate reflection based upon the design and construction information submitted for this dwelling for the purpose of carrying out the assessment, and that the supporting documentary evidence (identified in 11.1 and 11.2) pursuant to Part L of the Building Regulations 2010 (as amended) has been reviewed in the course of preparing this BREL Compliance Report.	
Signed: Name:	Assessor ID: Date:
b. Client Declaration	
This declaration by the client is confirmation that the dwelling has been constructed and completed according to the specifications set out in this BREL Compliance Report, and that photographic evidence of key stages, as described in 11.2, has been provided to the Assessor for this dwelling.	
Signed: Name:	Organisation: Date:

Full SAP Calculation Printout

Property Reference	78449-21	**Issued on Date**	03/10/2025
Assessment Reference	001	**Prop Type Ref**	GF Flat / Mid
Property	8 Shepherd Street, MANCHESTER, M9 4QW		

SAP Rating	88 B	**DER**	4.13	**TER**	15.88
Environmental	98 A	**% DER < TER**			73.99
CO_2 Emissions (t/year)	0.14	**DFEE**	24.40	**TFEE**	35.74
Compliance Check	See BREL	**% DFEE < TFEE**			31.73
% DPER < TPER	48.09	**DPER**	43.65	**TPER**	84.09

Assessor Details	Mr. Daniel Goddard	**Assessor ID**	CP52-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	37.9700	(1b)	x 2.3600	(2b) =	89.6092	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	37.9700					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	89.6092	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.3400	(17)
Infiltration rate		0.1170	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.0994	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1268	0.1243	0.1218	0.1094	0.1069	0.0945	0.0945	0.0920	0.0994	0.1069	0.1119	0.1169	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	80.1000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2263	0.2238	0.2213	0.2089	0.2064	0.1940	0.1940	0.1915	0.1989	0.2064	0.2114	0.2164	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door			2.1500	0.7800	1.6770			(26)
Window			4.4700	0.7282	3.2549			(27)
GF			37.9700	0.0900	3.4173	75.0000	2847.7500	(28a)
Main	38.8100	6.6200	32.1900	0.1300	4.1847	9.0000	289.7100	(29a)
Total net area of external elements Aum(A, m2)			76.7800					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	12.5339			(33)
Main dwelling								
Party Wall 1			27.2200	0.0000	0.0000	20.0000	544.4000	(32)
Party Ceiling			37.9700			20.0000	759.4000	(32b)
Timber			50.4000			9.0000	453.6000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	4894.8600 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		128.9139 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total

E2 Other lintels (including other steel lintels)	5.1000	0.1150	0.5865	
E3 Sill	5.1000	0.0170	0.0867	
E4 Jamb	10.8000	0.0940	1.0152	
E5 Ground floor (normal)	15.4000	0.0670	1.0318	
E7 Party floor between dwellings (in blocks of flats)	15.4000	0.0320	0.4928	
E16 Corner (normal)	12.6000	0.0680	0.8568	
E17 Corner (inverted - internal area greater than external area)	2.5200	-0.0290	-0.0731	
P1 Party wall - Ground floor	10.8000	0.0560	0.6048	
E18 Party wall between dwellings	2.5200	0.2400	0.6048	
E25 Staggered party wall between dwellings	5.0400	0.0560	0.2822	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				5.4886 (36)
Point Thermal bridges			(36a) =	0.0000
Total fabric heat loss			(33) + (36) + (36a) =	18.0224 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	6.6919	6.6184	6.5448	6.1772	6.1037	5.7361	5.7361	5.6626	5.8832	6.1037	6.2508	6.3978	(38)
Heat transfer coeff	24.7143	24.6408	24.5673	24.1997	24.1261	23.7585	23.7585	23.6850	23.9056	24.1261	24.2732	24.4202	(39)
Average = Sum(39)m / 12 =												24.1813	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6509	0.6490	0.6470	0.6373	0.6354	0.6257	0.6257	0.6238	0.6296	0.6354	0.6393	0.6431	(40)
HLP (average)												0.6369	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Assumed occupancy												1.3535	(42)
Hot water usage for mixer showers	46.9130	46.2079	45.1806	43.2150	41.7644	40.1467	39.2272	40.2468	41.3644	43.1013	45.1092	46.7332	(42a)
Hot water usage for baths	20.2973	19.9959	19.5714	18.7887	18.2026	17.5528	17.2017	17.6233	18.0822	18.7776	19.5764	20.2287	(42b)
Hot water usage for other uses	28.4911	27.4550	26.4190	25.3830	24.3469	23.3109	23.3109	24.3469	25.3830	26.4190	27.4550	28.4911	(42c)
Average daily hot water use (litres/day)												87.9720	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	95.7014	93.6589	91.1710	87.3866	84.3139	81.0104	79.7399	82.2170	84.8296	88.2979	92.1406	95.4530	(44)
Energy conte	151.5676	133.3690	140.1264	119.6279	113.5028	99.6117	96.4385	101.8018	104.6034	119.8195	131.2712	149.4563	(45)
Energy content (annual)											Total = Sum(45)m =	1461.1961	
Distribution loss (46)m = 0.15 x (45)m	22.7351	20.0053	21.0190	17.9442	17.0254	14.9418	14.4658	15.2703	15.6905	17.9729	19.6907	22.4185	(46)
Water storage loss:													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8694	(55)
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	178.5190	157.7122	167.0778	145.7099	140.4542	125.6937	123.3899	128.7532	130.6854	146.7709	157.3532	176.4077	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	178.5190	157.7122	167.0778	145.7099	140.4542	125.6937	123.3899	128.7532	130.6854	146.7709	157.3532	176.4077	(64)
										Total per year (kWh/year) = Sum(64)m =		1778.5271	(64)
12Total per year (kWh/year)												1779	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	50.3962	44.3452	46.5920	39.7763	37.7397	33.1209	32.0658	33.8491	34.7806	39.8400	43.6477	49.6942	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	67.4075	74.6297	67.4075	69.6544	67.4075	69.6544	67.4075	67.4075	69.6544	67.4075	69.6544	67.4075	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	116.4640	117.6725	114.6270	108.1436	99.9594	92.2675	87.1288	85.9203	88.9657	95.4491	103.6333	111.3253	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	(71)
Water heating gains (Table 5)	67.7369	65.9899	62.6237	55.2449	50.7254	46.0012	43.0992	45.4961	48.3064	53.5483	60.6218	66.7933	(72)
Total internal gains	294.9106	301.5944	287.9606	276.3452	261.3946	251.2255	240.9378	242.1262	250.2289	259.7073	277.2118	288.8284	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	1.6600	10.6334	0.3800	0.0000	0.7700	5.1648	(74)
South	2.8100	46.7521	0.3800	0.0000	0.7700	38.4398	(78)

Solar gains	43.6046	72.8247	96.9648	117.5754	130.7383	129.7432	125.0797	115.0218	103.9362	79.6516	51.9358	37.5212	(83)

Total gains	338.5153	374.4192	384.9254	393.9206	392.1329	380.9687	366.0174	357.1480	354.1651	339.3589	329.1476	326.3496	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	55.0161	55.1802	55.3453	56.1861	56.3573	57.2293	57.2293	57.4069	56.8773	56.3573	56.0159	55.6786	
alpha	4.6677	4.6787	4.6897	4.7457	4.7572	4.8153	4.8153	4.8271	4.7918	4.7572	4.7344	4.7119	
util living area													
	0.8944	0.8469	0.7909	0.6863	0.5543	0.3962	0.2851	0.3044	0.4593	0.6838	0.8357	0.9046	(86)
MIT	20.4100	20.5724	20.7217	20.8788	20.9621	20.9940	20.9990	20.9987	20.9876	20.8982	20.6642	20.3811	(87)
Th 2	20.3844	20.3861	20.3879	20.3965	20.3982	20.4069	20.4069	20.4086	20.4034	20.3982	20.3948	20.3913	(88)
util rest of house													
	0.8827	0.8316	0.7712	0.6602	0.5221	0.3604	0.2469	0.2655	0.4214	0.6533	0.8174	0.8938	(89)
MIT 2	19.7048	19.9024	20.0822	20.2710	20.3628	20.4023	20.4063	20.4078	20.3934	20.2967	20.0238	19.6755	(90)
Living area fraction										fLA = Living area / (4) =		0.4772	(91)
MIT	20.0413	20.2222	20.3874	20.5610	20.6488	20.6847	20.6892	20.6898	20.6770	20.5838	20.3294	20.0122	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0413	20.2222	20.3874	20.5610	20.6488	20.6847	20.6892	20.6898	20.6770	20.5838	20.3294	20.0122	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8756	0.8273	0.7712	0.6674	0.5356	0.3772	0.2651	0.2840	0.4388	0.6629	0.8153	0.8865	(94)
Useful gains	296.4101	309.7628	296.8354	262.9211	210.0362	143.7161	97.0329	101.4353	155.4244	224.9745	268.3427	289.3064	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	389.0364	377.5502	341.1745	282.1933	215.8997	144.5633	97.1530	101.6037	157.2258	240.8693	321.1191	386.1381	(97)
Space heating kWh													
	68.9139	45.5531	32.9883	13.8760	4.3624	0.0000	0.0000	0.0000	0.0000	11.8257	37.9990	72.0428	(98a)
Space heating requirement - total per year (kWh/year)												287.5612	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	68.9139	45.5531	32.9883	13.8760	4.3624	0.0000	0.0000	0.0000	0.0000	11.8257	37.9990	72.0428	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												287.5612	
Space heating per m2											(98c) / (4) =	7.5734	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Fraction of main heating from main system 2												0.0000	(203)
Fraction of total heating from main system 1												1.0000	(204)
Fraction of total heating from main system 2												0.0000	(205)
Efficiency of main space heating system 1 (in %)												100.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	68.9139	45.5531	32.9883	13.8760	4.3624	0.0000	0.0000	0.0000	0.0000	11.8257	37.9990	72.0428	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000		(210)
Space heating fuel (main heating system)													
	68.9139	45.5531	32.9883	13.8760	4.3624	0.0000	0.0000	0.0000	0.0000	11.8257	37.9990	72.0428	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement													
	178.5190	157.7122	167.0778	145.7099	140.4542	125.6937	123.3899	128.7532	130.6854	146.7709	157.3532	176.4077	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month													
	55.0102	48.5986	51.4846	44.9001	43.2806	38.7322	38.0223	39.6750	40.2704	45.2271	48.4880	54.3596	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	11.3091	10.2147	11.3091	10.9443	11.3091	10.9443	11.3091	11.3091	10.9443	11.3091	10.9443	11.3091	(231)
Lighting	13.5004	10.8306	9.7517	7.1445	5.5186	4.5088	5.0343	6.5438	8.4997	11.1521	12.5962	13.8757	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												287.5612	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												324.5200	
Water heating fuel used												548.0485	(219)
Space cooling fuel												0.0000	(221)

Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.2180)		
mechanical ventilation fans (SFP = 1.2180)	133.1557	(230a)
Total electricity for the above, kWh/year	133.1557	(231)
Electricity for lighting (calculated in Appendix L)	108.9563	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	1077.7218	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	287.5612	0.1572	45.2179	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	548.0485	0.1411	77.3114	(264)
Space and water heating			122.5293	(265)
Pumps, fans and electric keep-hot	133.1557	0.1387	18.4703	(267)
Energy for lighting	108.9563	0.1443	15.7258	(268)
Total CO2, kg/year			156.7254	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.1300	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	287.5612	1.5821	454.9539	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	548.0485	1.5216	833.9227	(278)
Space and water heating			1288.8767	(279)
Pumps, fans and electric keep-hot	133.1557	1.5128	201.4379	(281)
Energy for lighting	108.9563	1.5338	167.1209	(282)
Total Primary energy kWh/year			1657.4355	(286)
Dwelling Primary energy Rate (DPER)			43.6500	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		37.9700	(1b)	x 2.3600	(2b) =	89.6092	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	37.9700						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		89.6092	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.2232	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4732	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.4022	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.5128	0.5028	0.4927	0.4424	0.4324	0.3821	0.3821	0.3720	0.4022	0.4324	0.4525	0.4726	(22b)
Effective ac	0.6315	0.6264	0.6214	0.5979	0.5935	0.5730	0.5730	0.5692	0.5809	0.5935	0.6024	0.6117	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			2.1500	1.0000	2.1500			(26)
TER Opening Type			4.4700	1.1450	5.1183			(27)
GF			37.9700	0.1300	4.9361			(28a)
Main	38.8100	6.6200	32.1900	0.1800	5.7942			(29a)
Total net area of external elements Aum(A, m2)			76.7800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		17.9986			(33)
Main dwelling								
Party Wall 1			27.2200	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 138.9139 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	5.1000	0.0500	0.2550
E3 Sill	5.1000	0.0500	0.2550
E4 Jamb	10.8000	0.0500	0.5400
E5 Ground floor (normal)	15.4000	0.1600	2.4640
E7 Party floor between dwellings (in blocks of flats)	15.4000	0.0700	1.0780
E16 Corner (normal)	12.6000	0.0900	1.1340
E17 Corner (inverted - internal area greater than external area)	2.5200	-0.0900	-0.2268
P1 Party wall - Ground floor	10.8000	0.0800	0.8640
E18 Party wall between dwellings	2.5200	0.0600	0.1512
E25 Staggered party wall between dwellings	5.0400	0.0600	0.3024

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.8168 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 24.8154 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	18.6739	18.5229	18.3749	17.6798	17.5497	16.9442	16.9442	16.8321	17.1774	17.5497	17.8128	18.0879	(38)
Heat transfer coeff	43.4893	43.3383	43.1903	42.4952	42.3651	41.7597	41.7597	41.6475	41.9929	42.3651	42.6282	42.9033	(39)

Average = Sum(39)m / 12 = 42.4945

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1454	1.1414	1.1375	1.1192	1.1158	1.0998	1.0998	1.0969	1.1059	1.1158	1.1227	1.1299	(40)
HLP (average)												1.1192	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.3535 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	46.9130	46.2079	45.1806	43.2150	41.7644	40.1467	39.2272	40.2468	41.3644	43.1013	45.1092	46.7332	(42a)
Hot water usage for baths	20.2973	19.9959	19.5714	18.7887	18.2026	17.5528	17.2017	17.6233	18.0822	18.7776	19.5764	20.2287	(42b)
Hot water usage for other uses	28.4911	27.4550	26.4190	25.3830	24.3469	23.3109	23.3109	24.3469	25.3830	26.4190	27.4550	28.4911	(42c)

Average daily hot water use (litres/day) 87.9720 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	95.7014	93.6589	91.1710	87.3866	84.3139	81.0104	79.7399	82.2170	84.8296	88.2979	92.1406	95.4530	(44)
Energy conte	151.5676	133.3690	140.1264	119.6279	113.5028	99.6117	96.4385	101.8018	104.6034	119.8195	131.2712	149.4563	(45)
Energy content (annual)										Total = Sum(45)m =		1461.1961	
Distribution loss (46)m = 0.15 x (45)m	22.7351	20.0053	21.0190	17.9442	17.0254	14.9418	14.4658	15.2703	15.6905	17.9729	19.6907	22.4185	(46)

Water storage loss:
Store volume 150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.3938 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.7527 (55)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	198.1625	175.4547	186.7213	164.7198	160.0977	144.7035	143.0334	148.3967	149.6953	166.4144	176.3631	196.0513	(62)
WWHRS	-21.4466	-18.9676	-19.8618	-16.4463	-15.3274	-13.1158	-12.2939	-13.0734	-13.5701	-15.9976	-18.1233	-21.0495	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	176.7158	156.4871	166.8596	148.2735	144.7703	131.5878	130.7394	135.3234	136.1252	150.4168	158.2397	175.0018	(64)
									Total per year (kWh/year) = Sum(64)m =			1810.5403	(64)
12Total per year (kWh/year)												1811	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	87.6721	78.0138	83.8680	75.8498	75.0156	69.1944	69.3417	71.1250	70.8541	77.1159	79.7212	86.9702	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	65.4789	72.4945	65.4789	67.6615	65.4789	67.6615	65.4789	65.4789	67.6615	65.4789	67.6615	65.4789	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	116.4640	117.6725	114.6270	108.1436	99.9594	92.2675	87.1288	85.9203	88.9657	95.4491	103.6333	111.3253	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	(71)
Water heating gains (Table 5)	117.8389	116.0919	112.7258	105.3469	100.8274	96.1033	93.2012	95.5981	98.4085	103.6504	110.7238	116.8954	(72)

Total internal gains	346.0841	352.5612	339.1340	327.4544	312.5681	299.3346	289.1112	290.2996	298.3381	310.8808	328.3210	340.0019	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	1.6600	10.6334	0.6300	0.7000	0.7700	5.3945	(74)
South	2.8100	46.7521	0.6300	0.7000	0.7700	40.1494	(78)

Solar gains	45.5439	76.0635	101.2772	122.8044	136.5527	135.5134	130.6424	120.1373	108.5587	83.1940	54.2455	39.1899	(83)
Total gains	391.6280	428.6248	440.4112	450.2588	449.1208	434.8480	419.7537	410.4369	406.8967	394.0747	382.5665	379.1918	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	33.6900	33.8074	33.9232	34.4782	34.5840	35.0854	35.0854	35.1799	34.8906	34.5840	34.3706	34.1502	
alpha	3.2460	3.2538	3.2615	3.2985	3.3056	3.3390	3.3390	3.3453	3.3260	3.3056	3.2914	3.2767	
util living area													
	0.9331	0.9096	0.8788	0.8155	0.7152	0.5616	0.4217	0.4466	0.6260	0.8086	0.9009	0.9383	(86)
MIT	19.4276	19.6570	19.9553	20.3546	20.6802	20.8982	20.9703	20.9634	20.8456	20.4642	19.9129	19.4026	(87)
Th 2	19.9640	19.9672	19.9703	19.9852	19.9880	20.0010	20.0010	20.0034	19.9960	19.9880	19.9824	19.9765	(88)
util rest of house													
	0.9221	0.8952	0.8589	0.7844	0.6661	0.4891	0.3323	0.3575	0.5568	0.7713	0.8829	0.9281	(89)
MIT 2	18.1741	18.4597	18.8299	19.3211	19.6950	19.9281	19.9866	19.9845	19.8771	19.4592	18.7927	18.1516	(90)
Living area fraction										fLA = Living area / (4) =		0.4772	(91)
MIT	18.7723	19.0311	19.3669	19.8143	20.1651	20.3910	20.4560	20.4517	20.3393	19.9388	19.3273	18.7486	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.7723	19.0311	19.3669	19.8143	20.1651	20.3910	20.4560	20.4517	20.3393	19.9388	19.3273	18.7486	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9066	0.8796	0.8455	0.7786	0.6753	0.5184	0.3738	0.3985	0.5816	0.7693	0.8692	0.9130	(94)
Useful gains	355.0307	377.0359	372.3463	350.5740	303.2715	225.4122	156.9122	163.5524	236.6520	303.1467	332.5204	346.2076	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	629.3890	612.4174	555.7277	463.8067	358.6268	241.8317	161.0259	168.7415	262.0066	395.6381	521.2271	624.1838	(97)
Space heating kWh													
	204.1226	158.1763	136.4358	81.5275	41.1844	0.0000	0.0000	0.0000	0.0000	68.8136	135.8688	206.8142	(98a)
Space heating requirement - total per year (kWh/year)												1032.9432	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	204.1226	158.1763	136.4358	81.5275	41.1844	0.0000	0.0000	0.0000	0.0000	68.8136	135.8688	206.8142	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1032.9432	
Space heating per m2											(98c) / (4) =	27.2042	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	204.1226	158.1763	136.4358	81.5275	41.1844	0.0000	0.0000	0.0000	0.0000	68.8136	135.8688	206.8142	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	221.1512	171.3720	147.8177	88.3288	44.6201	0.0000	0.0000	0.0000	0.0000	74.5543	147.2035	224.0674	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	176.7158	156.4871	166.8596	148.2735	144.7703	131.5878	130.7394	135.3234	136.1252	150.4168	158.2397	175.0018	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.3839	84.0839	83.6121	82.7764	81.6324	79.8000	79.8000	79.8000	79.8000	82.4221	83.7199	84.4353	(217)
Fuel for water heating, kWh/month													
	209.4188	186.1084	199.5640	179.1253	177.3442	164.8970	163.8339	169.5781	170.5829	182.4957	189.0110	207.2613	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	13.6052	10.9146	9.8274	7.2000	5.5615	4.5438	5.0734	6.5945	8.5657	11.2386	12.6940	13.9834	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-18.3889	-26.2500	-38.2205	-43.5891	-47.5889	-44.7066	-44.2359	-41.5216	-36.7467	-30.3811	-20.3628	-15.8670	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-9.4088	-19.9034	-39.7394	-59.9177	-79.4083	-79.7844	-78.7658	-66.5369	-48.6209	-28.4473	-12.5639	-7.4254	(233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1119.1150	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2199.2206	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	109.8019	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-938.3812	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2575.7563	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1119.1150	0.2100	235.0142	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2199.2206	0.2100	461.8363	(264)
Space and water heating			696.8505	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	109.8019	0.1443	15.8478	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-407.8591	0.1343	-54.7615	
PV Unit electricity exported	-530.5221	0.1258	-66.7429	
Total			-121.5044	(269)
Total CO2, kg/year			603.1231	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			15.8800	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1119.1150	1.1300	1264.6000	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2199.2206	1.1300	2485.1192	(278)
Space and water heating			3749.7192	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	109.8019	1.5338	168.4179	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-407.8591	1.4962	-610.2410	
PV Unit electricity exported	-530.5221	0.4618	-244.9912	
Total			-855.2322	(283)
Total Primary energy kWh/year			3193.0057	(286)
Target Primary Energy Rate (TPER)			84.0900	(287)

Full SAP Calculation Printout

Property Reference	78449-21	**Issued on Date**	03/10/2025
Assessment Reference	001	**Prop Type Ref**	GF Flat / Mid
Property	8 Shepherd Street, MANCHESTER, M9 4QW		

SAP Rating	88 B	**DER**	4.13	**TER**	15.88
Environmental	98 A	**% DER < TER**			73.99
CO_2 Emissions (t/year)	0.14	**DFEE**	24.40	**TFEE**	35.74
Compliance Check	See BREL	**% DFEE < TFEE**			31.73
% DPER < TPER	48.09	**DPER**	43.65	**TPER**	84.09

Assessor Details	Mr. Daniel Goddard	**Assessor ID**	CP52-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	37.9700	(1b)	x 2.3600	(2b) =	89.6092	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	37.9700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	89.6092	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys		0 * 80 =	0.0000 (6a)
Number of open flues		0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000 (6d)
Number of flues attached to other heater		0 * 35 =	0.0000 (6e)
Number of blocked chimneys		0 * 20 =	0.0000 (6f)
Number of intermittent extract fans		2 * 10 =	20.0000 (7a)
Number of passive vents		0 * 10 =	0.0000 (7b)
Number of flueless gas fires		0 * 40 =	0.0000 (7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		20.0000 / (5) =	0.2232 (8)
Pressure test			Yes
Pressure Test Method			Blower Door
Measured/design AP50			2.3400 (17)
Infiltration rate			0.3402 (18)
Number of sides sheltered			2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =		0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =		0.2892 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3687	0.3615	0.3542	0.3181	0.3108	0.2747	0.2747	0.2675	0.2892	0.3108	0.3253	0.3398	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5680	0.5653	0.5627	0.5506	0.5483	0.5377	0.5377	0.5358	0.5418	0.5483	0.5529	0.5577	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door			2.1500	0.7800	1.6770			(26)
Window			4.4700	0.7282	3.2549			(27)
GF			37.9700	0.0900	3.4173	75.0000	2847.7500	(28a)
Main	38.8100	6.6200	32.1900	0.1300	4.1847	9.0000	289.7100	(29a)
Total net area of external elements Aum(A, m2)			76.7800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		12.5339			(33)
Main dwelling								
Party Wall 1			27.2200	0.0000	0.0000	20.0000	544.4000	(32)
Party Ceiling			37.9700			30.0000	1139.1000	(32b)
Timber			50.4000			9.0000	453.6000	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		5274.5600	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							138.9139	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	5.1000	0.1150	0.5865
E3 Sill	5.1000	0.0170	0.0867
E4 Jamb	10.8000	0.0940	1.0152

E5 Ground floor (normal)	15.4000	0.0670	1.0318	
E7 Party floor between dwellings (in blocks of flats)	15.4000	0.0320	0.4928	
E16 Corner (normal)	12.6000	0.0680	0.8568	
E17 Corner (inverted - internal area greater than external area)	2.5200	-0.0290	-0.0731	
P1 Party wall - Ground floor	10.8000	0.0560	0.6048	
E18 Party wall between dwellings	2.5200	0.2400	0.6048	
E25 Staggered party wall between dwellings	5.0400	0.0560	0.2822	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.4886 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 18.0224 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	16.7953	16.7172	16.6407	16.2814	16.2142	15.9013	15.9013	15.8433	16.0218	16.2142	16.3502	16.4924	(38)

Heat transfer coeff

	34.8177	34.7396	34.6631	34.3038	34.2366	33.9237	33.9237	33.8657	34.0442	34.2366	34.3726	34.5148	(39)

Average = Sum(39)m / 12 = 34.3035

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9170	0.9149	0.9129	0.9034	0.9017	0.8934	0.8934	0.8919	0.8966	0.9017	0.9053	0.9090	(40)

HLP (average) 0.9034

Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.3535 (42)

Hot water usage for mixer showers

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

	20.2973	19.9959	19.5714	18.7887	18.2026	17.5528	17.2017	17.6233	18.0822	18.7776	19.5764	20.2287	(42b)

Hot water usage for other uses

	28.4911	27.4550	26.4190	25.3830	24.3469	23.3109	23.3109	24.3469	25.3830	26.4190	27.4550	28.4911	(42c)

Average daily hot water use (litres/day) 44.7198 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	48.7884	47.4509	45.9904	44.1717	42.5496	40.8637	40.5126	41.9702	43.4652	45.1966	47.0315	48.7198	(44)
Energy conte	77.2689	67.5695	70.6855	60.4688	57.2799	50.2466	48.9965	51.9679	53.5969	61.3314	67.0049	76.2834	(45)

Energy content (annual) Total = Sum(45)m = 742.7004

Distribution loss (46)m = 0.15 x (45)m

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss:

Total storage loss

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

	65.6786	57.4341	60.0827	51.3985	48.6879	42.7096	41.6470	44.1727	45.5574	52.1317	56.9542	64.8409	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

	65.6786	57.4341	60.0827	51.3985	48.6879	42.7096	41.6470	44.1727	45.5574	52.1317	56.9542	64.8409	(64)

Total per year (kWh/year) = Sum(64)m = 631.2953 (64)

12Total per year (kWh/year) 631 (64)

Electric shower(s)

	37.5695	33.4747	36.5531	34.8822	35.5367	33.8986	35.0285	35.5367	34.8822	36.5531	35.8657	37.5695	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 427.3504 (64a)

Heat gains from water heating, kWh/month

	25.8120	22.7272	24.1589	21.5702	21.0562	19.1521	19.1689	19.9274	20.1099	22.1712	23.2050	25.6026	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	67.4075	74.6297	67.4075	69.6544	67.4075	69.6544	67.4075	67.4075	69.6544	67.4075	69.6544	67.4075	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	116.4640	117.6725	114.6270	108.1436	99.9594	92.2675	87.1288	85.9203	88.9657	95.4491	103.6333	111.3253	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	(71)

Water heating gains (Table 5)

	34.6936	33.8202	32.4717	29.9586	28.3013	26.6001	25.7646	26.7841	27.9304	29.8000	32.2292	34.4121	(72)

Total internal gains

	261.8673	269.4248	257.8085	251.0589	238.9705	231.8243	223.6032	223.4142	229.8529	235.9589	248.8192	256.4472	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	1.6600	10.6334	0.3800	0.0000	0.7700	5.1648	(74)
South	2.8100	46.7521	0.3800	0.0000	0.7700	38.4398	(78)

Solar gains	43.6046	72.8247	96.9648	117.5754	130.7383	129.7432	125.0797	115.0218	103.9362	79.6516	51.9358	37.5212	(83)
Total gains	305.4720	342.2495	354.7734	368.6343	369.7089	361.5675	348.6829	338.4360	333.7891	315.6105	300.7549	293.9684	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	42.0808	42.1753	42.2684	42.7111	42.7950	43.1898	43.1898	43.2637	43.0368	42.7950	42.6257	42.4501	
alpha	3.8054	3.8117	3.8179	3.8474	3.8530	3.8793	3.8793	3.8842	3.8691	3.8530	3.8417	3.8300	
util living area	0.9571	0.9341	0.9043	0.8380	0.7309	0.5643	0.4188	0.4478	0.6384	0.8389	0.9300	0.9620	(86)
MIT	19.6538	19.8836	20.1525	20.5036	20.7746	20.9387	20.9849	20.9802	20.8978	20.5729	20.0743	19.6135	(87)
Th 2	20.1531	20.1548	20.1565	20.1646	20.1661	20.1731	20.1731	20.1744	20.1704	20.1661	20.1630	20.1599	(88)
util rest of house	0.9501	0.9238	0.8890	0.8120	0.6883	0.5018	0.3438	0.3723	0.5783	0.8084	0.9173	0.9558	(89)
MIT 2	18.9343	19.1588	19.4201	19.7573	20.0006	20.1374	20.1669	20.1658	20.1065	19.8275	19.3540	18.9001	(90)
Living area fraction											fLA = Living area / (4) =	0.4772	(91)
MIT	19.2776	19.5047	19.7696	20.1134	20.3700	20.5198	20.5572	20.5544	20.4841	20.1832	19.6978	19.2405	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2776	19.5047	19.7696	20.1134	20.3700	20.5198	20.5572	20.5544	20.4841	20.1832	19.6978	19.2405	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9414	0.9146	0.8811	0.8102	0.6993	0.5287	0.3791	0.4076	0.6018	0.8091	0.9091	0.9475	(94)
Useful gains	287.5698	313.0145	312.5969	298.6844	258.5194	191.1503	132.1895	137.9376	200.8881	255.3454	273.4276	278.5368	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	521.4869	507.3603	459.9657	384.6644	296.8303	200.8203	134.2444	140.6932	217.3423	328.0961	433.0177	519.1212	(97)
Space heating kWh	174.0343	130.6004	109.6424	61.9056	28.5033	0.0000	0.0000	0.0000	0.0000	54.1266	114.9049	178.9948	(98a)
Space heating requirement - total per year (kWh/year)												852.7122	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	174.0343	130.6004	109.6424	61.9056	28.5033	0.0000	0.0000	0.0000	0.0000	54.1266	114.9049	178.9948	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												852.7122	
Space heating per m2											(98c) / (4) =	22.4575	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	318.8826	251.0353	257.3796	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8692	0.9216	0.9100	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	277.1647	231.3648	234.2197	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	393.4028	379.9217	369.2923	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	83.6914	110.5263	100.4940	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction											fC = cooled area / (4) =	1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	20.9229	27.6316	25.1235	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												73.6779	(107)
Energy for space heating												22.4575	(99)
Energy for space cooling												1.9404	(108)
Total												24.3979	(109)
Fabric Energy Efficiency (DFEE)												24.4	(109)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	37.9700	(1b)	x 2.3600	(2b) =	89.6092	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	37.9700					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	89.6092	(5)

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2. Ventilation rate

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	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.2232	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	

Measured/design AP50		5.0000 (17)
Infiltration rate		0.4732 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.4022 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.5128	0.5028	0.4927	0.4424	0.4324	0.3821	0.3821	0.3720	0.4022	0.4324	0.4525	0.4726	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =		0.0000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.6315	0.6264	0.6214	0.5979	0.5935	0.5730	0.5730	0.5692	0.5809	0.5935	0.6024	0.6117	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			2.1500	1.0000	2.1500			(26)
TER Opening Type			4.4700	1.1450	5.1183			(27)
GF			37.9700	0.1300	4.9361			(28a)
Main	38.8100	6.6200	32.1900	0.1800	5.7942			(29a)
Total net area of external elements Aum(A, m2)			76.7800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		17.9986			(33)
Main dwelling								
Party Wall 1			27.2200	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		138.9139 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	5.1000	0.0500	0.2550
E3 Sill	5.1000	0.0500	0.2550
E4 Jamb	10.8000	0.0500	0.5400
E5 Ground floor (normal)	15.4000	0.1600	2.4640
E7 Party floor between dwellings (in blocks of flats)	15.4000	0.0700	1.0780
E16 Corner (normal)	12.6000	0.0900	1.1340
E17 Corner (inverted - internal area greater than external area)	2.5200	-0.0900	-0.2268
P1 Party wall - Ground floor	10.8000	0.0800	0.8640
E18 Party wall between dwellings	2.5200	0.0600	0.1512
E25 Staggered party wall between dwellings	5.0400	0.0600	0.3024

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		6.8168 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	24.8154 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	18.6739	18.5229	18.3749	17.6798	17.5497	16.9442	16.9442	16.8321	17.1774	17.5497	17.8128	18.0879	(38)
Heat transfer coeff	43.4893	43.3383	43.1903	42.4952	42.3651	41.7597	41.7597	41.6475	41.9929	42.3651	42.6282	42.9033	(39)

Average = Sum(39)m / 12 =		42.4945

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1454	1.1414	1.1375	1.1192	1.1158	1.0998	1.0998	1.0969	1.1059	1.1158	1.1227	1.1299	(40)
HLP (average)												1.1192	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy		1.3535 (42)

Hot water usage for mixer showers

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

	20.2973	19.9959	19.5714	18.7887	18.2026	17.5528	17.2017	17.6233	18.0822	18.7776	19.5764	20.2287	(42b)

Hot water usage for other uses

	28.4911	27.4550	26.4190	25.3830	24.3469	23.3109	23.3109	24.3469	25.3830	26.4190	27.4550	28.4911	(42c)

Average daily hot water use (litres/day)		44.7198 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	48.7884	47.4509	45.9904	44.1717	42.5496	40.8637	40.5126	41.9702	43.4652	45.1966	47.0315	48.7198	(44)
Energy conte	77.2689	67.5695	70.6855	60.4688	57.2799	50.2466	48.9965	51.9679	53.5969	61.3314	67.0049	76.2834	(45)

Energy content (annual)	Total = Sum(45)m =	742.7004

Distribution loss (46)m = 0.15 x (45)m

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss:

Total storage loss

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

	65.6786	57.4341	60.0827	51.3985	48.6879	42.7096	41.6470	44.1727	45.5574	52.1317	56.9542	64.8409	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

	65.6786	57.4341	60.0827	51.3985	48.6879	42.7096	41.6470	44.1727	45.5574	52.1317	56.9542	64.8409	(64)

	Total per year (kWh/year) = Sum(64)m =	631.2953 (64)
12Total per year (kWh/year)		631 (64)

Electric shower(s)

	37.5695	33.4747	36.5531	34.8822	35.5367	33.8986	35.0285	35.5367	34.8822	36.5531	35.8657	37.5695	(64a)

	Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	427.3504 (64a)

Heat gains from water heating, kWh/month

	25.8120	22.7272	24.1589	21.5702	21.0562	19.1521	19.1689	19.9274	20.1099	22.1712	23.2050	25.6026	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	65.4789	72.4945	65.4789	67.6615	65.4789	67.6615	65.4789	65.4789	67.6615	65.4789	67.6615	65.4789	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	116.4640	117.6725	114.6270	108.1436	99.9594	92.2675	87.1288	85.9203	88.9657	95.4491	103.6333	111.3253	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	(71)
Water heating gains (Table 5)													
	34.6936	33.8202	32.4717	29.9586	28.3013	26.6001	25.7646	26.7841	27.9304	29.8000	32.2292	34.4121	(72)
Total internal gains													
	259.9388	267.2895	255.8800	249.0660	237.0420	229.8314	221.6747	221.4856	227.8600	234.0304	246.8263	254.5186	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	1.6600	10.6334	0.6300	0.7000	0.7700	5.3945	(74)
South	2.8100	46.7521	0.6300	0.7000	0.7700	40.1494	(78)

Solar gains	45.5439	76.0635	101.2772	122.8044	136.5527	135.5134	130.6424	120.1373	108.5587	83.1940	54.2455	39.1899	(83)
Total gains	305.4827	343.3531	357.1572	371.8704	373.5947	365.3448	352.3171	341.6228	336.4186	317.2243	301.0719	293.7085	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	33.6900	33.8074	33.9232	34.4782	34.5840	35.0854	35.0854	35.1799	34.8906	34.5840	34.3706	34.1502	
alpha	3.2460	3.2538	3.2615	3.2985	3.3056	3.3390	3.3390	3.3453	3.3260	3.3056	3.2914	3.2767	
util living area													
	0.9643	0.9468	0.9243	0.8736	0.7877	0.6384	0.4913	0.5221	0.7085	0.8751	0.9440	0.9680	(86)
MIT	19.1188	19.3743	19.7066	20.1688	20.5619	20.8498	20.9531	20.9416	20.7735	20.2838	19.6478	19.0898	(87)
Th 2	19.9640	19.9672	19.9703	19.9852	19.9880	20.0010	20.0010	20.0034	19.9960	19.9880	19.9824	19.9765	(88)
util rest of house													
	0.9578	0.9374	0.9101	0.8487	0.7434	0.5635	0.3913	0.4231	0.6405	0.8460	0.9324	0.9622	(89)
MIT 2	18.2705	18.5226	18.8492	19.3028	19.6655	19.9142	19.9826	19.9790	19.8545	19.4196	18.8051	18.2510	(90)
Living area fraction									fLA = Living area / (4) =			0.4772	(91)
MIT	18.6753	18.9291	19.2584	19.7161	20.0933	20.3607	20.4457	20.4384	20.2931	19.8320	19.2073	18.6513	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.6753	18.9291	19.2584	19.7161	20.0933	20.3607	20.4457	20.4384	20.2931	19.8320	19.2073	18.6513	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9475	0.9256	0.8985	0.8412	0.7484	0.5919	0.4372	0.4678	0.6621	0.8408	0.9215	0.9526	(94)
Useful gains	289.4340	317.8246	320.8950	312.8213	279.6084	216.2368	154.0380	159.8259	222.7356	266.7334	277.4516	279.7745	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	625.1719	607.9967	551.0377	459.6303	355.5811	240.5635	160.5967	168.1877	260.0653	391.1152	516.1108	620.0088	(97)
Space heating kWh													
	249.7890	194.9957	171.2262	105.7025	56.5237	0.0000	0.0000	0.0000	0.0000	92.5400	171.8347	253.1343	(98a)
Space heating requirement - total per year (kWh/year)												1295.7461	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	249.7890	194.9957	171.2262	105.7025	56.5237	0.0000	0.0000	0.0000	0.0000	92.5400	171.8347	253.1343	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1295.7461	
Space heating per m2										(98c) / (4) =		34.1255	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	392.5407	309.0214	316.5212	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7767	0.8469	0.8304	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	304.8873	261.7117	262.8314	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	399.9784	386.2413	375.0344	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	68.4656	92.6500	83.4790	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	17.1164	23.1625	20.8697	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												61.1486	(107)
Energy for space heating												34.1255	(99)
Energy for space cooling												1.6104	(108)
Total												35.7360	(109)
Fabric Energy Efficiency (TFEE)												35.7	(109)

Full SAP Calculation Printout

Property Reference	78449-21	**Issued on Date**	03/10/2025
Assessment Reference	001	**Prop Type Ref**	GF Flat / Mid
Property	8 Shepherd Street, MANCHESTER, M9 4QW		

SAP Rating	88 B	**DER**	4.13	**TER**	15.88
Environmental	98 A	**% DER < TER**			73.99
CO_2 Emissions (t/year)	0.14	**DFEE**	24.40	**TFEE**	35.74
Compliance Check	See BREL	**% DFEE < TFEE**			31.73
% DPER < TPER	48.09	**DPER**	43.65	**TPER**	84.09

Assessor Details	Mr. Daniel Goddard	**Assessor ID**	CP52-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	37.9700	(1b)	x 2.3600	(2b) =	89.6092	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	37.9700					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	89.6092	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.3400	(17)
Infiltration rate		0.1170	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.0994	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1268	0.1243	0.1218	0.1094	0.1069	0.0945	0.0945	0.0920	0.0994	0.1069	0.1119	0.1169	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	80.1000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2263	0.2238	0.2213	0.2089	0.2064	0.1940	0.1940	0.1915	0.1989	0.2064	0.2114	0.2164	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door			2.1500	0.7800	1.6770			(26)
Window			4.4700	0.7282	3.2549			(27)
GF			37.9700	0.0900	3.4173	75.0000	2847.7500	(28a)
Main	38.8100	6.6200	32.1900	0.1300	4.1847	9.0000	289.7100	(29a)
Total net area of external elements Aum(A, m2)			76.7800					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	12.5339			(33)
Main dwelling								
Party Wall 1			27.2200	0.0000	0.0000	20.0000	544.4000	(32)
Party Ceiling			37.9700			20.0000	759.4000	(32b)
Timber			50.4000			9.0000	453.6000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	4894.8600 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		128.9139 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total

E2 Other lintels (including other steel lintels)	5.1000	0.1150	0.5865	
E3 Sill	5.1000	0.0170	0.0867	
E4 Jamb	10.8000	0.0940	1.0152	
E5 Ground floor (normal)	15.4000	0.0670	1.0318	
E7 Party floor between dwellings (in blocks of flats)	15.4000	0.0320	0.4928	
E16 Corner (normal)	12.6000	0.0680	0.8568	
E17 Corner (inverted - internal area greater than external area)	2.5200	-0.0290	-0.0731	
P1 Party wall - Ground floor	10.8000	0.0560	0.6048	
E18 Party wall between dwellings	2.5200	0.2400	0.6048	
E25 Staggered party wall between dwellings	5.0400	0.0560	0.2822	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				5.4886 (36)
Point Thermal bridges			(36a) =	0.0000
Total fabric heat loss			(33) + (36) + (36a) =	18.0224 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	6.6919	6.6184	6.5448	6.1772	6.1037	5.7361	5.7361	5.6626	5.8832	6.1037	6.2508	6.3978	(38)
Heat transfer coeff	24.7143	24.6408	24.5673	24.1997	24.1261	23.7585	23.7585	23.6850	23.9056	24.1261	24.2732	24.4202	(39)
Average = Sum(39)m / 12 =												24.1813	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6509	0.6490	0.6470	0.6373	0.6354	0.6257	0.6257	0.6238	0.6296	0.6354	0.6393	0.6431	(40)
HLP (average)												0.6369	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Assumed occupancy												1.3535	(42)
Hot water usage for mixer showers	46.9130	46.2079	45.1806	43.2150	41.7644	40.1467	39.2272	40.2468	41.3644	43.1013	45.1092	46.7332	(42a)
Hot water usage for baths	20.2973	19.9959	19.5714	18.7887	18.2026	17.5528	17.2017	17.6233	18.0822	18.7776	19.5764	20.2287	(42b)
Hot water usage for other uses	28.4911	27.4550	26.4190	25.3830	24.3469	23.3109	23.3109	24.3469	25.3830	26.4190	27.4550	28.4911	(42c)
Average daily hot water use (litres/day)												87.9720	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	95.7014	93.6589	91.1710	87.3866	84.3139	81.0104	79.7399	82.2170	84.8296	88.2979	92.1406	95.4530	(44)
Energy conte	151.5676	133.3690	140.1264	119.6279	113.5028	99.6117	96.4385	101.8018	104.6034	119.8195	131.2712	149.4563	(45)
Energy content (annual)											Total = Sum(45)m =	1461.1961	
Distribution loss (46)m = 0.15 x (45)m	22.7351	20.0053	21.0190	17.9442	17.0254	14.9418	14.4658	15.2703	15.6905	17.9729	19.6907	22.4185	(46)
Water storage loss:													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8694	(55)
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	178.5190	157.7122	167.0778	145.7099	140.4542	125.6937	123.3899	128.7532	130.6854	146.7709	157.3532	176.4077	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	178.5190	157.7122	167.0778	145.7099	140.4542	125.6937	123.3899	128.7532	130.6854	146.7709	157.3532	176.4077	(64)
										Total per year (kWh/year) = Sum(64)m =		1778.5271	(64)
12Total per year (kWh/year)												1779	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	50.3962	44.3452	46.5920	39.7763	37.7397	33.1209	32.0658	33.8491	34.7806	39.8400	43.6477	49.6942	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	67.4075	74.6297	67.4075	69.6544	67.4075	69.6544	67.4075	67.4075	69.6544	67.4075	69.6544	67.4075	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	116.4640	117.6725	114.6270	108.1436	99.9594	92.2675	87.1288	85.9203	88.9657	95.4491	103.6333	111.3253	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	(71)
Water heating gains (Table 5)	67.7369	65.9899	62.6237	55.2449	50.7254	46.0012	43.0992	45.4961	48.3064	53.5483	60.6218	66.7933	(72)
Total internal gains	294.9106	301.5944	287.9606	276.3452	261.3946	251.2255	240.9378	242.1262	250.2289	259.7073	277.2118	288.8284	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	1.6600	10.6334	0.3800	0.0000	0.7700	5.1648	(74)
South	2.8100	46.7521	0.3800	0.0000	0.7700	38.4398	(78)

Solar gains	43.6046	72.8247	96.9648	117.5754	130.7383	129.7432	125.0797	115.0218	103.9362	79.6516	51.9358	37.5212	(83)

Total gains	338.5153	374.4192	384.9254	393.9206	392.1329	380.9687	366.0174	357.1480	354.1651	339.3589	329.1476	326.3496	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	55.0161	55.1802	55.3453	56.1861	56.3573	57.2293	57.2293	57.4069	56.8773	56.3573	56.0159	55.6786	
alpha	4.6677	4.6787	4.6897	4.7457	4.7572	4.8153	4.8153	4.8271	4.7918	4.7572	4.7344	4.7119	
util living area													
	0.8944	0.8469	0.7909	0.6863	0.5543	0.3962	0.2851	0.3044	0.4593	0.6838	0.8357	0.9046	(86)
MIT	20.4100	20.5724	20.7217	20.8788	20.9621	20.9940	20.9990	20.9987	20.9876	20.8982	20.6642	20.3811	(87)
Th 2	20.3844	20.3861	20.3879	20.3965	20.3982	20.4069	20.4069	20.4086	20.4034	20.3982	20.3948	20.3913	(88)
util rest of house													
	0.8827	0.8316	0.7712	0.6602	0.5221	0.3604	0.2469	0.2655	0.4214	0.6533	0.8174	0.8938	(89)
MIT 2	19.7048	19.9024	20.0822	20.2710	20.3628	20.4023	20.4063	20.4078	20.3934	20.2967	20.0238	19.6755	(90)
Living area fraction										fLA = Living area / (4) =		0.4772	(91)
MIT	20.0413	20.2222	20.3874	20.5610	20.6488	20.6847	20.6892	20.6898	20.6770	20.5838	20.3294	20.0122	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0413	20.2222	20.3874	20.5610	20.6488	20.6847	20.6892	20.6898	20.6770	20.5838	20.3294	20.0122	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8756	0.8273	0.7712	0.6674	0.5356	0.3772	0.2651	0.2840	0.4388	0.6629	0.8153	0.8865	(94)
Useful gains	296.4101	309.7628	296.8354	262.9211	210.0362	143.7161	97.0329	101.4353	155.4244	224.9745	268.3427	289.3064	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	389.0364	377.5502	341.1745	282.1933	215.8997	144.5633	97.1530	101.6037	157.2258	240.8693	321.1191	386.1381	(97)
Space heating kWh													
	68.9139	45.5531	32.9883	13.8760	4.3624	0.0000	0.0000	0.0000	0.0000	11.8257	37.9990	72.0428	(98a)
Space heating requirement - total per year (kWh/year)												287.5612	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	68.9139	45.5531	32.9883	13.8760	4.3624	0.0000	0.0000	0.0000	0.0000	11.8257	37.9990	72.0428	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												287.5612	
Space heating per m2											(98c) / (4) =	7.5734	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Fraction of main heating from main system 2												0.0000	(203)
Fraction of total heating from main system 1												1.0000	(204)
Fraction of total heating from main system 2												0.0000	(205)
Efficiency of main space heating system 1 (in %)												100.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	68.9139	45.5531	32.9883	13.8760	4.3624	0.0000	0.0000	0.0000	0.0000	11.8257	37.9990	72.0428	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000		(210)
Space heating fuel (main heating system)													
	68.9139	45.5531	32.9883	13.8760	4.3624	0.0000	0.0000	0.0000	0.0000	11.8257	37.9990	72.0428	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement													
	178.5190	157.7122	167.0778	145.7099	140.4542	125.6937	123.3899	128.7532	130.6854	146.7709	157.3532	176.4077	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month													
	55.0102	48.5986	51.4846	44.9001	43.2806	38.7322	38.0223	39.6750	40.2704	45.2271	48.4880	54.3596	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	11.3091	10.2147	11.3091	10.9443	11.3091	10.9443	11.3091	11.3091	10.9443	11.3091	10.9443	11.3091	(231)
Lighting	13.5004	10.8306	9.7517	7.1445	5.5186	4.5088	5.0343	6.5438	8.4997	11.1521	12.5962	13.8757	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												287.5612	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												324.5200	
Water heating fuel used												548.0485	(219)
Space cooling fuel												0.0000	(221)

Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.2180)		
mechanical ventilation fans (SFP = 1.2180)	133.1557	(230a)
Total electricity for the above, kWh/year	133.1557	(231)
Electricity for lighting (calculated in Appendix L)	108.9563	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	1077.7218	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	287.5612	0.1572	45.2179	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	548.0485	0.1411	77.3114	(264)
Space and water heating			122.5293	(265)
Pumps, fans and electric keep-hot	133.1557	0.1387	18.4703	(267)
Energy for lighting	108.9563	0.1443	15.7258	(268)
Total CO2, kg/year			156.7254	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.1300	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	287.5612	1.5821	454.9539	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	548.0485	1.5216	833.9227	(278)
Space and water heating			1288.8767	(279)
Pumps, fans and electric keep-hot	133.1557	1.5128	201.4379	(281)
Energy for lighting	108.9563	1.5338	167.1209	(282)
Total Primary energy kWh/year			1657.4355	(286)
Dwelling Primary energy Rate (DPER)			43.6500	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		37.9700	(1b)	x 2.3600	(2b) =	89.6092	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	37.9700						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		89.6092	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.2232	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4732	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.4022	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.5128	0.5028	0.4927	0.4424	0.4324	0.3821	0.3821	0.3720	0.4022	0.4324	0.4525	0.4726	(22b)
Effective ac	0.6315	0.6264	0.6214	0.5979	0.5935	0.5730	0.5730	0.5692	0.5809	0.5935	0.6024	0.6117	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			2.1500	1.0000	2.1500			(26)
TER Opening Type			4.4700	1.1450	5.1183			(27)
GF			37.9700	0.1300	4.9361			(28a)
Main	38.8100	6.6200	32.1900	0.1800	5.7942			(29a)
Total net area of external elements Aum(A, m2)			76.7800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		17.9986			(33)
Main dwelling								
Party Wall 1			27.2200	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 138.9139 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	5.1000	0.0500	0.2550
E3 Sill	5.1000	0.0500	0.2550
E4 Jamb	10.8000	0.0500	0.5400
E5 Ground floor (normal)	15.4000	0.1600	2.4640
E7 Party floor between dwellings (in blocks of flats)	15.4000	0.0700	1.0780
E16 Corner (normal)	12.6000	0.0900	1.1340
E17 Corner (inverted - internal area greater than external area)	2.5200	-0.0900	-0.2268
P1 Party wall - Ground floor	10.8000	0.0800	0.8640
E18 Party wall between dwellings	2.5200	0.0600	0.1512
E25 Staggered party wall between dwellings	5.0400	0.0600	0.3024

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.8168 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 24.8154 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	18.6739	18.5229	18.3749	17.6798	17.5497	16.9442	16.9442	16.8321	17.1774	17.5497	17.8128	18.0879	(38)
Heat transfer coeff	43.4893	43.3383	43.1903	42.4952	42.3651	41.7597	41.7597	41.6475	41.9929	42.3651	42.6282	42.9033	(39)

Average = Sum(39)m / 12 = 42.4945

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1454	1.1414	1.1375	1.1192	1.1158	1.0998	1.0998	1.0969	1.1059	1.1158	1.1227	1.1299	(40)
HLP (average)												1.1192	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.3535 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	46.9130	46.2079	45.1806	43.2150	41.7644	40.1467	39.2272	40.2468	41.3644	43.1013	45.1092	46.7332	(42a)
Hot water usage for baths	20.2973	19.9959	19.5714	18.7887	18.2026	17.5528	17.2017	17.6233	18.0822	18.7776	19.5764	20.2287	(42b)
Hot water usage for other uses	28.4911	27.4550	26.4190	25.3830	24.3469	23.3109	23.3109	24.3469	25.3830	26.4190	27.4550	28.4911	(42c)

Average daily hot water use (litres/day) 87.9720 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	95.7014	93.6589	91.1710	87.3866	84.3139	81.0104	79.7399	82.2170	84.8296	88.2979	92.1406	95.4530	(44)
Energy conte	151.5676	133.3690	140.1264	119.6279	113.5028	99.6117	96.4385	101.8018	104.6034	119.8195	131.2712	149.4563	(45)
Energy content (annual)										Total = Sum(45)m =		1461.1961	
Distribution loss (46)m = 0.15 x (45)m	22.7351	20.0053	21.0190	17.9442	17.0254	14.9418	14.4658	15.2703	15.6905	17.9729	19.6907	22.4185	(46)

Water storage loss:
Store volume 150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.3938 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.7527 (55)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	198.1625	175.4547	186.7213	164.7198	160.0977	144.7035	143.0334	148.3967	149.6953	166.4144	176.3631	196.0513	(62)
WWHRS	-21.4466	-18.9676	-19.8618	-16.4463	-15.3274	-13.1158	-12.2939	-13.0734	-13.5701	-15.9976	-18.1233	-21.0495	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	176.7158	156.4871	166.8596	148.2735	144.7703	131.5878	130.7394	135.3234	136.1252	150.4168	158.2397	175.0018	(64)
									Total per year (kWh/year) = Sum(64)m =			1810.5403	(64)
12Total per year (kWh/year)												1811	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	87.6721	78.0138	83.8680	75.8498	75.0156	69.1944	69.3417	71.1250	70.8541	77.1159	79.7212	86.9702	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	65.4789	72.4945	65.4789	67.6615	65.4789	67.6615	65.4789	65.4789	67.6615	65.4789	67.6615	65.4789	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	116.4640	117.6725	114.6270	108.1436	99.9594	92.2675	87.1288	85.9203	88.9657	95.4491	103.6333	111.3253	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	(71)
Water heating gains (Table 5)	117.8389	116.0919	112.7258	105.3469	100.8274	96.1033	93.2012	95.5981	98.4085	103.6504	110.7238	116.8954	(72)

Total internal gains	346.0841	352.5612	339.1340	327.4544	312.5681	299.3346	289.1112	290.2996	298.3381	310.8808	328.3210	340.0019	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	1.6600	10.6334	0.6300	0.7000	0.7700	5.3945	(74)
South	2.8100	46.7521	0.6300	0.7000	0.7700	40.1494	(78)

Solar gains	45.5439	76.0635	101.2772	122.8044	136.5527	135.5134	130.6424	120.1373	108.5587	83.1940	54.2455	39.1899	(83)
Total gains	391.6280	428.6248	440.4112	450.2588	449.1208	434.8480	419.7537	410.4369	406.8967	394.0747	382.5665	379.1918	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	33.6900	33.8074	33.9232	34.4782	34.5840	35.0854	35.0854	35.1799	34.8906	34.5840	34.3706	34.1502	
alpha	3.2460	3.2538	3.2615	3.2985	3.3056	3.3390	3.3390	3.3453	3.3260	3.3056	3.2914	3.2767	
util living area													
	0.9331	0.9096	0.8788	0.8155	0.7152	0.5616	0.4217	0.4466	0.6260	0.8086	0.9009	0.9383	(86)
MIT	19.4276	19.6570	19.9553	20.3546	20.6802	20.8982	20.9703	20.9634	20.8456	20.4642	19.9129	19.4026	(87)
Th 2	19.9640	19.9672	19.9703	19.9852	19.9880	20.0010	20.0010	20.0034	19.9960	19.9880	19.9824	19.9765	(88)
util rest of house													
	0.9221	0.8952	0.8589	0.7844	0.6661	0.4891	0.3323	0.3575	0.5568	0.7713	0.8829	0.9281	(89)
MIT 2	18.1741	18.4597	18.8299	19.3211	19.6950	19.9281	19.9866	19.9845	19.8771	19.4592	18.7927	18.1516	(90)
Living area fraction										fLA = Living area / (4) =		0.4772	(91)
MIT	18.7723	19.0311	19.3669	19.8143	20.1651	20.3910	20.4560	20.4517	20.3393	19.9388	19.3273	18.7486	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.7723	19.0311	19.3669	19.8143	20.1651	20.3910	20.4560	20.4517	20.3393	19.9388	19.3273	18.7486	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9066	0.8796	0.8455	0.7786	0.6753	0.5184	0.3738	0.3985	0.5816	0.7693	0.8692	0.9130	(94)
Useful gains	355.0307	377.0359	372.3463	350.5740	303.2715	225.4122	156.9122	163.5524	236.6520	303.1467	332.5204	346.2076	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	629.3890	612.4174	555.7277	463.8067	358.6268	241.8317	161.0259	168.7415	262.0066	395.6381	521.2271	624.1838	(97)
Space heating kWh													
	204.1226	158.1763	136.4358	81.5275	41.1844	0.0000	0.0000	0.0000	0.0000	68.8136	135.8688	206.8142	(98a)
Space heating requirement - total per year (kWh/year)												1032.9432	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	204.1226	158.1763	136.4358	81.5275	41.1844	0.0000	0.0000	0.0000	0.0000	68.8136	135.8688	206.8142	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1032.9432	
Space heating per m2											(98c) / (4) =	27.2042	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	204.1226	158.1763	136.4358	81.5275	41.1844	0.0000	0.0000	0.0000	0.0000	68.8136	135.8688	206.8142	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	221.1512	171.3720	147.8177	88.3288	44.6201	0.0000	0.0000	0.0000	0.0000	74.5543	147.2035	224.0674	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	176.7158	156.4871	166.8596	148.2735	144.7703	131.5878	130.7394	135.3234	136.1252	150.4168	158.2397	175.0018	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.3839	84.0839	83.6121	82.7764	81.6324	79.8000	79.8000	79.8000	79.8000	82.4221	83.7199	84.4353	(217)
Fuel for water heating, kWh/month													
	209.4188	186.1084	199.5640	179.1253	177.3442	164.8970	163.8339	169.5781	170.5829	182.4957	189.0110	207.2613	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	13.6052	10.9146	9.8274	7.2000	5.5615	4.5438	5.0734	6.5945	8.5657	11.2386	12.6940	13.9834	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-18.3889	-26.2500	-38.2205	-43.5891	-47.5889	-44.7066	-44.2359	-41.5216	-36.7467	-30.3811	-20.3628	-15.8670	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-9.4088	-19.9034	-39.7394	-59.9177	-79.4083	-79.7844	-78.7658	-66.5369	-48.6209	-28.4473	-12.5639	-7.4254	(233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1119.1150	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2199.2206	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	109.8019	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-938.3812	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2575.7563	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1119.1150	0.2100	235.0142	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2199.2206	0.2100	461.8363	(264)
Space and water heating			696.8505	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	109.8019	0.1443	15.8478	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-407.8591	0.1343	-54.7615	
PV Unit electricity exported	-530.5221	0.1258	-66.7429	
Total			-121.5044	(269)
Total CO2, kg/year			603.1231	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			15.8800	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1119.1150	1.1300	1264.6000	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2199.2206	1.1300	2485.1192	(278)
Space and water heating			3749.7192	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	109.8019	1.5338	168.4179	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-407.8591	1.4962	-610.2410	
PV Unit electricity exported	-530.5221	0.4618	-244.9912	
Total			-855.2322	(283)
Total Primary energy kWh/year			3193.0057	(286)
Target Primary Energy Rate (TPER)			84.0900	(287)

Full SAP Calculation Printout

Property Reference	78449-21	**Issued on Date**	03/10/2025
Assessment Reference	001	**Prop Type Ref**	GF Flat / Mid
Property	8 Shepherd Street, MANCHESTER, M9 4QW		

SAP Rating	88 B	**DER**	4.13	**TER**	15.88
Environmental	98 A	**% DER < TER**			73.99
CO_2 Emissions (t/year)	0.14	**DFEE**	24.40	**TFEE**	35.74
Compliance Check	See BREL	**% DFEE < TFEE**			31.73
% DPER < TPER	48.09	**DPER**	43.65	**TPER**	84.09

Assessor Details	Mr. Daniel Goddard	**Assessor ID**	CP52-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	37.9700 (1b)	x	2.3600 (2b)	=	89.6092	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	37.9700					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	89.6092	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.3400	(17)
Infiltration rate		0.1170	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.0994	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1268	0.1243	0.1218	0.1094	0.1069	0.0945	0.0945	0.0920	0.0994	0.1069	0.1119	0.1169	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =		80.1000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2263	0.2238	0.2213	0.2089	0.2064	0.1940	0.1940	0.1915	0.1989	0.2064	0.2114	0.2164	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door			2.1500	0.7800	1.6770			(26)
Window			4.4700	0.7282	3.2549			(27)
GF			37.9700	0.0900	3.4173	75.0000	2847.7500	(28a)
Main	38.8100	6.6200	32.1900	0.1300	4.1847	9.0000	289.7100	(29a)
Total net area of external elements Aum(A, m2)			76.7800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		12.5339			(33)
Main dwelling								
Party Wall 1			27.2200	0.0000	0.0000	20.0000	544.4000	(32)
Party Ceiling			37.9700			30.0000	1139.1000	(32b)
Timber			50.4000			9.0000	453.6000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 5274.5600 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	138.9139 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total

E2 Other lintels (including other steel lintels)	5.1000	0.1150	0.5865	
E3 Sill	5.1000	0.0170	0.0867	
E4 Jamb	10.8000	0.0940	1.0152	
E5 Ground floor (normal)	15.4000	0.0670	1.0318	
E7 Party floor between dwellings (in blocks of flats)	15.4000	0.0320	0.4928	
E16 Corner (normal)	12.6000	0.0680	0.8568	
E17 Corner (inverted - internal area greater than external area)	2.5200	-0.0290	-0.0731	
P1 Party wall - Ground floor	10.8000	0.0560	0.6048	
E18 Party wall between dwellings	2.5200	0.2400	0.6048	
E25 Staggered party wall between dwellings	5.0400	0.0560	0.2822	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.4886 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 18.0224 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	6.6919	6.6184	6.5448	6.1772	6.1037	5.7361	5.7361	5.6626	5.8832	6.1037	6.2508	6.3978	(38)
Heat transfer coeff	24.7143	24.6408	24.5673	24.1997	24.1261	23.7585	23.7585	23.6850	23.9056	24.1261	24.2732	24.4202	(39)

Average = Sum(39)m / 12 = 24.1813

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6509	0.6490	0.6470	0.6373	0.6354	0.6257	0.6257	0.6238	0.6296	0.6354	0.6393	0.6431	(40)
HLP (average)												0.6369	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.3535 (42)

Hot water usage for mixer showers

46.9130	46.2079	45.1806	43.2150	41.7644	40.1467	39.2272	40.2468	41.3644	43.1013	45.1092	46.7332	(42a)

Hot water usage for baths

20.2973	19.9959	19.5714	18.7887	18.2026	17.5528	17.2017	17.6233	18.0822	18.7776	19.5764	20.2287	(42b)

Hot water usage for other uses

28.4911	27.4550	26.4190	25.3830	24.3469	23.3109	23.3109	24.3469	25.3830	26.4190	27.4550	28.4911	(42c)

Average daily hot water use (litres/day) 87.9720 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	95.7014	93.6589	91.1710	87.3866	84.3139	81.0104	79.7399	82.2170	84.8296	88.2979	92.1406	95.4530	(44)
Energy conte	151.5676	133.3690	140.1264	119.6279	113.5028	99.6117	96.4385	101.8018	104.6034	119.8195	131.2712	149.4563	(45)
Energy content (annual)											Total = Sum(45)m =	1461.1961	
Distribution loss (46)m = 0.15 x (45)m	22.7351	20.0053	21.0190	17.9442	17.0254	14.9418	14.4658	15.2703	15.6905	17.9729	19.6907	22.4185	(46)

Water storage loss:
Store volume 200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.6100 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.8694 (55)
Total storage loss

26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)

If cylinder contains dedicated solar storage

26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

178.5190	157.7122	167.0778	145.7099	140.4542	125.6937	123.3899	128.7532	130.6854	146.7709	157.3532	176.4077	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	178.5190	157.7122	167.0778	145.7099	140.4542	125.6937	123.3899	128.7532	130.6854	146.7709	157.3532	176.4077	(64)

Total per year (kWh/year) = Sum(64)m = 1778.5271 (64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

50.3962	44.3452	46.5920	39.7763	37.7397	33.1209	32.0658	33.8491	34.7806	39.8400	43.6477	49.6942	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	81.2094	81.2094	81.2094	81.2094	81.2094	81.2094	81.2094	81.2094	81.2094	81.2094	81.2094	81.2094	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	15.4239	13.6994	11.1411	8.4345	6.3049	5.3229	5.7515	7.4761	10.0344	12.7409	14.8705	15.8526	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	173.8268	175.6306	171.0851	161.4084	149.1932	137.7127	130.0430	128.2392	132.7847	142.4614	154.6766	166.1571	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	44.4744	44.4744	44.4744	44.4744	44.4744	44.4744	44.4744	44.4744	44.4744	44.4744	44.4744	44.4744	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		(70)
Losses e.g. evaporation (negative values) (Table 5)	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	(71)
Water heating gains (Table 5)	67.7369	65.9899	62.6237	55.2449	50.7254	46.0012	43.0992	45.4961	48.3064	53.5483	60.6218	66.7933	(72)
Total internal gains	328.5318	326.8640	316.3941	296.6319	277.7677	260.5810	250.4379	252.7556	262.6697	280.2949	301.7131	320.3472	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	1.6600	10.6334	0.3800	0.0000	0.7700	5.1648	(74)
South	2.8100	46.7521	0.3800	0.0000	0.7700	38.4398	(78)

Solar gains	43.6046	72.8247	96.9648	117.5754	130.7383	129.7432	125.0797	115.0218	103.9362	79.6516	51.9358	37.5212	(83)
Total gains	372.1364	399.6888	413.3589	414.2073	408.5060	390.3242	375.5175	367.7774	366.6059	359.9465	353.6489	357.8684	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	59.2837	59.4606	59.6385	60.5445	60.7290	61.6686	61.6686	61.8600	61.2893	60.7290	60.3611	59.9976	
alpha	4.9522	4.9640	4.9759	5.0363	5.0486	5.1112	5.1112	5.1240	5.0860	5.0486	5.0241	4.9998	
util living area	0.8720	0.8292	0.7653	0.6657	0.5369	0.3876	0.2781	0.2958	0.4456	0.6586	0.8138	0.8847	(86)
MIT	20.5534	20.6693	20.7979	20.9132	20.9743	20.9962	20.9994	20.9992	20.9920	20.9295	20.7480	20.5248	(87)
Th 2	20.3844	20.3861	20.3879	20.3965	20.3982	20.4069	20.4069	20.4086	20.4034	20.3982	20.3948	20.3913	(88)
util rest of house	0.8582	0.8125	0.7441	0.6390	0.5049	0.3523	0.2407	0.2580	0.4084	0.6275	0.7936	0.8720	(89)
MIT 2	19.8769	20.0167	20.1694	20.3082	20.3748	20.4040	20.4066	20.4082	20.3971	20.3294	20.1207	19.8487	(90)
Living area fraction										fLA = Living area / (4) =		0.4772	(91)
MIT	20.1997	20.3281	20.4693	20.5970	20.6609	20.6866	20.6895	20.6902	20.6810	20.6158	20.4201	20.1714	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.1997	20.3281	20.4693	20.5970	20.6609	20.6866	20.6895	20.6902	20.6810	20.6158	20.4201	20.1714	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8538	0.8108	0.7470	0.6480	0.5190	0.3690	0.2585	0.2760	0.4258	0.6389	0.7945	0.8670	(94)
Useful gains	317.7299	324.0740	308.7844	268.4165	212.0058	144.0386	97.0890	101.5136	156.0998	229.9730	280.9749	310.2814	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	392.9511	380.1614	343.1876	283.0624	216.1916	144.6089	97.1608	101.6146	157.3223	241.6427	323.3201	390.0239	(97)
Space heating kWh	55.9646	37.6907	25.5959	10.5450	3.1142	0.0000	0.0000	0.0000	0.0000	8.6822	30.4885	59.3284	(98a)
Space heating requirement - total per year (kWh/year)												231.4097	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	55.9646	37.6907	25.5959	10.5450	3.1142	0.0000	0.0000	0.0000	0.0000	8.6822	30.4885	59.3284	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												231.4097	
Space heating per m2											(98c) / (4) =	6.0945	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	55.9646	37.6907	25.5959	10.5450	3.1142	0.0000	0.0000	0.0000	0.0000	8.6822	30.4885	59.3284	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	55.9646	37.6907	25.5959	10.5450	3.1142	0.0000	0.0000	0.0000	0.0000	8.6822	30.4885	59.3284	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	178.5190	157.7122	167.0778	145.7099	140.4542	125.6937	123.3899	128.7532	130.6854	146.7709	157.3532	176.4077	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month	55.0102	48.5986	51.4846	44.9001	43.2806	38.7322	38.0223	39.6750	40.2704	45.2271	48.4880	54.3596	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	11.3091	10.2147	11.3091	10.9443	11.3091	10.9443	11.3091	11.3091	10.9443	11.3091	10.9443	11.3091	(231)
Lighting	13.5004	10.8306	9.7517	7.1445	5.5186	4.5088	5.0343	6.5438	8.4997	11.1521	12.5962	13.8757	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year

Space heating fuel - main system 1	231.4097	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	324.5200	
Water heating fuel used	548.0485	(219)
Space cooling fuel	0.0000	(221)

Electricity for pumps and fans:

(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.2180)		
mechanical ventilation fans (SFP = 1.2180)	133.1557	(230a)
Total electricity for the above, kWh/year	133.1557	(231)
Electricity for lighting (calculated in Appendix L)	108.9563	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	1021.5703	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	231.4097	16.4900	38.1595	(240)
Space heating - main system 2	0.0000	16.4900	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	548.0485	16.4900	90.3732	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	133.1557	16.4900	21.9574	(249)
Energy for lighting	108.9563	16.4900	17.9669	(250)
Additional standing charges			0.0000	(251)
Total energy cost			168.4569	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.7309	(257)
SAP value		88.1518	
SAP rating (Section 12)		88	(258)
SAP band		B	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	231.4097	0.1575	36.4430	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	548.0485	0.1411	77.3114	(264)
Space and water heating			113.7545	(265)
Pumps, fans and electric keep-hot	133.1557	0.1387	18.4703	(267)
Energy for lighting	108.9563	0.1443	15.7258	(268)
Total CO2, kg/year			147.9506	(272)
CO2 emissions per m2			3.9000	(273)
EI value			97.6105	
EI rating			98	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	37.9700	(1b) x	2.3600	(2b) =	89.6092	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	37.9700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		89.6092	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.3400	(17)
Infiltration rate		0.1170	(18)
Number of sides sheltered		2	(19)

Shelter factor									(20) = 1 - [0.075 x (19)] =			0.8500	(20)
Infiltration rate adjusted to include shelter factor									(21) = (18) x (20) =			0.0994	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.6000	4.5000	4.5000	4.1000	4.2000	3.7000	3.5000	3.5000	3.7000	4.1000	4.1000	4.2000	(22)
Wind factor	1.1500	1.1250	1.1250	1.0250	1.0500	0.9250	0.8750	0.8750	0.9250	1.0250	1.0250	1.0500	(22a)
Adj infilt rate	0.1144	0.1119	0.1119	0.1019	0.1044	0.0920	0.0870	0.0870	0.0920	0.1019	0.1019	0.1044	(22b)

Balanced mechanical ventilation with heat recovery		
If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	80.1000	(23c)

Effective ac	0.2139	0.2114	0.2114	0.2014	0.2039	0.1915	0.1865	0.1865	0.1915	0.2014	0.2014	0.2039	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Door			2.1500	0.7800	1.6770			(26)
Window			4.4700	0.7282	3.2549			(27)
GF			37.9700	0.0900	3.4173	75.0000	2847.7500	(28a)
Main	38.8100	6.6200	32.1900	0.1300	4.1847	9.0000	289.7100	(29a)
Total net area of external elements Aum(A, m2)			76.7800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		12.5339			(33)
Main dwelling								
Party Wall 1			27.2200	0.0000	0.0000	20.0000	544.4000	(32)
Party Ceiling			37.9700			30.0000	1139.1000	(32b)
Timber			50.4000			9.0000	453.6000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	5274.5600 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		138.9139 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	5.1000	0.1150	0.5865
E3 Sill	5.1000	0.0170	0.0867
E4 Jamb	10.8000	0.0940	1.0152
E5 Ground floor (normal)	15.4000	0.0670	1.0318
E7 Party floor between dwellings (in blocks of flats)	15.4000	0.0320	0.4928
E16 Corner (normal)	12.6000	0.0680	0.8568
E17 Corner (inverted - internal area greater than external area)	2.5200	-0.0290	-0.0731
P1 Party wall - Ground floor	10.8000	0.0560	0.6048
E18 Party wall between dwellings	2.5200	0.2400	0.6048
E25 Staggered party wall between dwellings	5.0400	0.0560	0.2822

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		5.4886 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	18.0224 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	6.3243	6.2508	6.2508	5.9567	6.0302	5.6626	5.5156	5.5156	5.6626	5.9567	5.9567	6.0302	(38)
Heat transfer coeff	24.3467	24.2732	24.2732	23.9791	24.0526	23.6850	23.5380	23.5380	23.6850	23.9791	23.9791	24.0526	(39)
Average = Sum(39)m / 12 =												23.9485	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6412	0.6393	0.6393	0.6315	0.6335	0.6238	0.6199	0.6199	0.6238	0.6315	0.6315	0.6335	(40)
HLP (average)												0.6307	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.3535	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
46.9130	46.2079	45.1806	43.2150	41.7644	40.1467	39.2272	40.2468	41.3644	43.1013	45.1092	46.7332	(42a)

Hot water usage for baths

20.2973	19.9959	19.5714	18.7887	18.2026	17.5528	17.2017	17.6233	18.0822	18.7776	19.5764	20.2287	(42b)

Hot water usage for other uses

28.4911	27.4550	26.4190	25.3830	24.3469	23.3109	23.3109	24.3469	25.3830	26.4190	27.4550	28.4911	(42c)
Average daily hot water use (litres/day)												87.9720	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	95.7014	93.6589	91.1710	87.3866	84.3139	81.0104	79.7399	82.2170	84.8296	88.2979	92.1406	95.4530	(44)
Energy conte	151.5676	133.3690	140.1264	119.6279	113.5028	99.6117	96.4385	101.8018	104.6034	119.8195	131.2712	149.4563	(45)
Energy content (annual)										Total = Sum(45)m =		1461.1961	
Distribution loss (46)m = 0.15 x (45)m	22.7351	20.0053	21.0190	17.9442	17.0254	14.9418	14.4658	15.2703	15.6905	17.9729	19.6907	22.4185	(46)

Water storage loss:		
Store volume	200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):	1.6100	(48)
Temperature factor from Table 2b	0.5400	(49)
Enter (49) or (54) in (55)	0.8694	(55)

Total storage loss

26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)

If cylinder contains dedicated solar storage

26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

178.5190	157.7122	167.0778	145.7099	140.4542	125.6937	123.3899	128.7532	130.6854	146.7709	157.3532	176.4077	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

178.5190	157.7122	167.0778	145.7099	140.4542	125.6937	123.3899	128.7532	130.6854	146.7709	157.3532	176.4077	(64)
									Total per year (kWh/year) = Sum(64)m =		1778.5271	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)

Heat gains from water heating, kWh/month

	50.3962	44.3452	46.5920	39.7763	37.7397	33.1209	32.0658	33.8491	34.7806	39.8400	43.6477	49.6942 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	81.2094	81.2094	81.2094	81.2094	81.2094	81.2094	81.2094	81.2094	81.2094	81.2094	81.2094	81.2094	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	15.4239	13.6994	11.1411	8.4345	6.3049	5.3229	5.7515	7.4761	10.0344	12.7409	14.8705	15.8526	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	173.8268	175.6306	171.0851	161.4084	149.1932	137.7127	130.0430	128.2392	132.7847	142.4614	154.6766	166.1571	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	44.4744	44.4744	44.4744	44.4744	44.4744	44.4744	44.4744	44.4744	44.4744	44.4744	44.4744	44.4744	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	(71)

Water heating gains (Table 5)

	67.7369	65.9899	62.6237	55.2449	50.7254	46.0012	43.0992	45.4961	48.3064	53.5483	60.6218	66.7933	(72)

Total internal gains

	328.5318	326.8640	316.3941	296.6319	277.7677	260.5810	250.4379	252.7556	262.6697	280.2949	301.7131	320.3472	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	1.6600	8.9975	0.3800	0.0000	0.7700	4.3702	(74)
South	2.8100	39.5594	0.3800	0.0000	0.7700	32.5260	(78)

Solar gains	36.8962	64.7331	90.9045	112.0885	121.8862	123.2561	116.4763	105.4977	98.5135	73.6174	45.6405	33.9477	(83)
Total gains	365.4280	391.5971	407.2986	408.7205	399.6539	383.8371	366.9142	358.2533	361.1831	353.9123	347.3536	354.2950	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	60.1788	60.3611	60.3611	61.1014	60.9146	61.8600	62.2465	62.2465	61.8600	61.1014	61.1014	60.9146	
alpha	5.0119	5.0241	5.0241	5.0734	5.0610	5.1240	5.1498	5.1498	5.1240	5.0734	5.0734	5.0610	
util living area	0.8661	0.8225	0.7610	0.6509	0.5140	0.3688	0.2820	0.2953	0.4482	0.6545	0.8046	0.8764	(86)
MIT	20.5920	20.7002	20.8113	20.9261	20.9804	20.9972	20.9994	20.9993	20.9921	20.9340	20.7746	20.5727	(87)
Th 2	20.3931	20.3948	20.3948	20.4017	20.4000	20.4086	20.4121	20.4121	20.4086	20.4017	20.4017	20.4000	(88)
util rest of house	0.8517	0.8051	0.7396	0.6235	0.4808	0.3329	0.2444	0.2569	0.4111	0.6229	0.7835	0.8628	(89)
MIT 2	19.9315	20.0615	20.1914	20.3273	20.3826	20.4066	20.4118	20.4117	20.4024	20.3376	20.1584	19.9145	(90)
Living area fraction										fLA = Living area / (4) =		0.4772	(91)
MIT	20.2467	20.3663	20.4872	20.6130	20.6679	20.6884	20.6922	20.6921	20.6838	20.6222	20.4525	20.2286	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.2467	20.3663	20.4872	20.6130	20.6679	20.6884	20.6922	20.6921	20.6838	20.6222	20.4525	20.2286	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8480	0.8042	0.7429	0.6333	0.4957	0.3499	0.2623	0.2752	0.4284	0.6347	0.7854	0.8587	(94)
Useful gains	309.8731	314.9331	302.5925	258.8433	198.1160	134.3211	96.2503	98.5802	154.7325	224.6273	272.7963	304.2360	(95)
Ext temp.	4.7000	5.3000	6.7000	9.3000	12.3000	15.0000	16.6000	16.5000	14.1000	10.8000	7.5000	4.6000	(96)
Heat loss rate W	378.5099	365.7060	334.6597	271.2763	201.2692	134.7309	96.3228	98.6737	155.9373	235.5276	310.5892	375.9081	(97)
Space heating kWh	51.0658	34.1194	23.8580	8.9518	2.3460	0.0000	0.0000	0.0000	0.0000	8.1099	27.2109	53.3240	(98a)
Space heating requirement - total per year (kWh/year)												208.9857	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	51.0658	34.1194	23.8580	8.9518	2.3460	0.0000	0.0000	0.0000	0.0000	8.1099	27.2109	53.3240	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												208.9857	
Space heating per m2											(98c) / (4) =	5.5040	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Fraction of main heating from main system 2	0.0000 (203)
Fraction of total heating from main system 1	1.0000 (204)
Fraction of total heating from main system 2	0.0000 (205)
Efficiency of main space heating system 1 (in %)	100.0000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	51.0658	34.1194	23.8580	8.9518	2.3460	0.0000	0.0000	0.0000	0.0000	8.1099	27.2109	53.3240	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	51.0658	34.1194	23.8580	8.9518	2.3460	0.0000	0.0000	0.0000	0.0000	8.1099	27.2109	53.3240	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)

Space heating fuel (secondary)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)

Space heating fuel used, main system 2 0.0000 (213)

Water heating

Water heating requirement

178.5190	157.7122	167.0778	145.7099	140.4542	125.6937	123.3899	128.7532	130.6854	146.7709	157.3532	176.4077	(64)

Efficiency of water heater 324.5200 (216)

(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)

Fuel for water heating, kWh/month

	55.0102	48.5986	51.4846	44.9001	43.2806	38.7322	38.0223	39.6750	40.2704	45.2271	48.4880	54.3596	(219)

Space cooling fuel requirement

(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	11.3091	10.2147	11.3091	10.9443	11.3091	10.9443	11.3091	11.3091	10.9443	11.3091	10.9443	11.3091	(231)
Lighting	13.5004	10.8306	9.7517	7.1445	5.5186	4.5088	5.0343	6.5438	8.4997	11.1521	12.5962	13.8757	(232)

Electricity generated by PVs (Appendix M) (negative quantity)

(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)

Electricity generated by PVs (Appendix M) (negative quantity)

(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year

Space heating fuel - main system 1 208.9857 (211)
Space heating fuel - main system 2 0.0000 (213)
Space heating fuel - secondary 0.0000 (215)
Efficiency of water heater 324.5200
Water heating fuel used 548.0485 (219)
Space cooling fuel 0.0000 (221)

Electricity for pumps and fans:
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.2180)
mechanical ventilation fans (SFP = 1.2180) 133.1557 (230a)
Total electricity for the above, kWh/year 133.1557 (231)
Electricity for lighting (calculated in Appendix L) 108.9563 (232)

Energy saving/generation technologies (Appendices M ,N and Q)
PV generation 0.0000 (233)
Wind generation 0.0000 (234)
Hydro-electric generation (Appendix N) 0.0000 (235a)
Electricity generated - Micro CHP (Appendix N) 0.0000 (235)
Appendix Q - special features
Energy saved or generated -0.0000 (236)
Energy used 0.0000 (237)
Total delivered energy for all uses 999.1463 (238)

10a. Fuel costs - using BEDF prices (583)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	208.9857	28.4300	59.4146	(240)
Space heating - main system 2	0.0000	28.4300	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	548.0485	28.4300	155.8102	(247)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(247a)
Pumps, fans and electric keep-hot	133.1557	28.4300	37.8562	(249)
Energy for lighting	108.9563	28.4300	30.9763	(250)
Additional standing charges			0.0000	(251)
Total energy cost			284.0573	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	208.9857	0.1576	32.9265	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	548.0485	0.1411	77.3114	(264)
Space and water heating			110.2379	(265)
Pumps, fans and electric keep-hot	133.1557	0.1387	18.4703	(267)
Energy for lighting	108.9563	0.1443	15.7258	(268)
Total CO2, kg/year			144.4340	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	208.9857	1.5833	330.8772	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	548.0485	1.5216	833.9227	(278)
Space and water heating			1164.7999	(279)
Pumps, fans and electric keep-hot	133.1557	1.5128	201.4379	(281)
Energy for lighting	108.9563	1.5338	167.1209	(282)
Total Primary energy kWh/year			1533.3587	(286)

SAP 10 EPC IMPROVEMENTS

001

Current energy efficiency rating: B 88
Current environmental impact rating: A 98

N Solar water heating Not applicable
U Solar photovoltaic panels Not applicable
V2 Wind turbine Not applicable

Recommended measures: SAP change Cost change CO2 change
(none)

Typical annual savings | Energy efficiency | Environmental impact

Recommended measures
(none)

Total Savings £0 0.00 kg/m²

Potential energy efficiency rating: B 88
Potential environmental impact rating: A 98

Fuel prices for cost data on this page from database revision number 583 TEST (01 Oct 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, West Pennines (England)):

	Current	Potential	Saving
Electricity	£284	£284	£0
Space heating	£97	£97	£0
Water heating	£156	£156	£0
Lighting	£31	£31	£0
Total cost of fuels	£284	£284	£0
Total cost of uses	£284	£284	£0
Delivered energy	26 kWh/m²	26 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.1 tonnes	0.1 tonnes	0.0 tonnes
CO2 emissions per m²	4 kg/m²	4 kg/m²	0 kg/m²
Primary energy	40 kWh/m²	40 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	37.9700	(1b)	x 2.3600	(2b) =	89.6092	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	37.9700					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	89.6092	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.3400	(17)
Infiltration rate		0.1170	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.0994	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1268	0.1243	0.1218	0.1094	0.1069	0.0945	0.0945	0.0920	0.0994	0.1069	0.1119	0.1169	(22b)

Balanced mechanical ventilation with heat recovery
If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 80.1000 (23c)

Effective ac	0.2263	0.2238	0.2213	0.2089	0.2064	0.1940	0.1940	0.1915	0.1989	0.2064	0.2114	0.2164	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Door			2.1500	0.7800	1.6770			(26)
Window			4.4700	0.7282	3.2549			(27)
GF			37.9700	0.0900	3.4173	75.0000	2847.7500	(28a)
Main	38.8100	6.2200	32.1900	0.1300	4.1847	9.0000	289.7100	(29a)
Total net area of external elements Aum(A, m2)			76.7800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		12.5339			(33)
Main dwelling								
Party Wall 1			27.2200	0.0000	0.0000	20.0000	544.4000	(32)
Party Ceiling			37.9700			30.0000	1139.1000	(32b)
Timber			50.4000			9.0000	453.6000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	5274.5600 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		138.9139 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	5.1000	0.1150	0.5865
E3 Sill	5.1000	0.0170	0.0867
E4 Jamb	10.8000	0.0940	1.0152
E5 Ground floor (normal)	15.4000	0.0670	1.0318
E7 Party floor between dwellings (in blocks of flats)	15.4000	0.0320	0.4928
E16 Corner (normal)	12.6000	0.0680	0.8568
E17 Corner (inverted - internal area greater than external area)	2.5200	-0.0290	-0.0731
P1 Party wall - Ground floor	10.8000	0.0560	0.6048
E18 Party wall between dwellings	2.5200	0.2400	0.6048
E25 Staggered party wall between dwellings	5.0400	0.0560	0.2822

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		5.4886 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	18.0224 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	6.6919	6.6184	6.5448	6.1772	6.1037	5.7361	5.7361	5.6626	5.8832	6.1037	6.2508	6.3978	(38)
Heat transfer coeff	24.7143	24.6408	24.5673	24.1997	24.1261	23.7585	23.7585	23.6850	23.9056	24.1261	24.2732	24.4202	(39)
Average = Sum(39)m / 12 =												24.1813	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6509	0.6490	0.6470	0.6373	0.6354	0.6257	0.6257	0.6238	0.6296	0.6354	0.6393	0.6431	(40)
HLP (average)												0.6369	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		1.3535 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	46.9130	46.2079	45.1806	43.2150	41.7644	40.1467	39.2272	40.2468	41.3644	43.1013	45.1092	46.7332	(42a)
Hot water usage for baths	20.2973	19.9959	19.5714	18.7887	18.2026	17.5528	17.2017	17.6233	18.0822	18.7776	19.5764	20.2287	(42b)
Hot water usage for other uses	28.4911	27.4550	26.4190	25.3830	24.3469	23.3109	23.3109	24.3469	25.3830	26.4190	27.4550	28.4911	(42c)
Average daily hot water use (litres/day)												87.9720	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	95.7014	93.6589	91.1710	87.3866	84.3139	81.0104	79.7399	82.2170	84.8296	88.2979	92.1406	95.4530	(44)
Energy conte	151.5676	133.3690	140.1264	119.6279	113.5028	99.6117	96.4385	101.8018	104.6034	119.8195	131.2712	149.4563	(45)
Energy content (annual)										Total = Sum(45)m =		1461.1961	
Distribution loss (46)m = 0.15 x (45)m	22.7351	20.0053	21.0190	17.9442	17.0254	14.9418	14.4658	15.2703	15.6905	17.9729	19.6907	22.4185	(46)
Water storage loss:													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8694	(55)
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	178.5190	157.7122	167.0778	145.7099	140.4542	125.6937	123.3899	128.7532	130.6854	146.7709	157.3532	176.4077	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	178.5190	157.7122	167.0778	145.7099	140.4542	125.6937	123.3899	128.7532	130.6854	146.7709	157.3532	176.4077	(64)
										Total per year (kWh/year) = Sum(64)m =		1778.5271	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	50.3962	44.3452	46.5920	39.7763	37.7397	33.1209	32.0658	33.8491	34.7806	39.8400	43.6477	49.6942	(65)

5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	81.2094	81.2094	81.2094	81.2094	81.2094	81.2094	81.2094	81.2094	81.2094	81.2094	81.2094	81.2094	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	15.4239	13.6994	11.1411	8.4345	6.3049	5.3229	5.7515	7.4761	10.0344	12.7409	14.8705	15.8526	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	173.8268	175.6306	171.0851	161.4084	149.1932	137.7127	130.0430	128.2392	132.7847	142.4614	154.6766	166.1571	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	44.4744	44.4744	44.4744	44.4744	44.4744	44.4744	44.4744	44.4744	44.4744	44.4744	44.4744	44.4744	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	(71)
Water heating gains (Table 5)	67.7369	65.9899	62.6237	55.2449	50.7254	46.0012	43.0992	45.4961	48.3064	53.5483	60.6218	66.7933	(72)

Total internal gains

	328.5318	326.8640	316.3941	296.6319	277.7677	260.5810	250.4379	252.7556	262.6697	280.2949	301.7131	320.3472 (73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	1.6600	10.6334	0.3800	0.0000	0.7700	5.1648	(74)
South	2.8100	46.7521	0.3800	0.0000	0.7700	38.4398	(78)

Solar gains	43.6046	72.8247	96.9648	117.5754	130.7383	129.7432	125.0797	115.0218	103.9362	79.6516	51.9358	37.5212	(83)
Total gains	372.1364	399.6888	413.3589	414.2073	408.5060	390.3242	375.5175	367.7774	366.6059	359.9465	353.6489	357.8684	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	59.2837	59.4606	59.6385	60.5445	60.7290	61.6686	61.6686	61.8600	61.2893	60.7290	60.3611	59.9976	
alpha	4.9522	4.9640	4.9759	5.0363	5.0486	5.1112	5.1112	5.1240	5.0860	5.0486	5.0241	4.9998	
util living area	0.8720	0.8292	0.7653	0.6657	0.5369	0.3876	0.2781	0.2958	0.4456	0.6586	0.8138	0.8847	(86)
MIT	20.5534	20.6693	20.7979	20.9132	20.9743	20.9962	20.9994	20.9992	20.9920	20.9295	20.7480	20.5248	(87)
Th 2	20.3844	20.3861	20.3879	20.3965	20.3982	20.4069	20.4069	20.4086	20.4034	20.3982	20.3948	20.3913	(88)
util rest of house	0.8582	0.8125	0.7441	0.6390	0.5049	0.3523	0.2407	0.2580	0.4084	0.6275	0.7936	0.8720	(89)
MIT 2	19.8769	20.0167	20.1694	20.3082	20.3748	20.4040	20.4066	20.4082	20.3971	20.3294	20.1207	19.8487	(90)
Living area fraction										fLA = Living area / (4) =		0.4772	(91)
MIT	20.1997	20.3281	20.4693	20.5970	20.6609	20.6866	20.6895	20.6902	20.6810	20.6158	20.4201	20.1714	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.1997	20.3281	20.4693	20.5970	20.6609	20.6866	20.6895	20.6902	20.6810	20.6158	20.4201	20.1714	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8538	0.8108	0.7470	0.6480	0.5190	0.3690	0.2585	0.2760	0.4258	0.6389	0.7945	0.8670	(94)
Useful gains	317.7299	324.0740	308.7844	268.4165	212.0058	144.0386	97.0890	101.5136	156.0998	229.9730	280.9749	310.2814	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	392.9511	380.1614	343.1876	283.0624	216.1916	144.6089	97.1608	101.6146	157.3223	241.6427	323.3201	390.0239	(97)
Space heating kWh	55.9646	37.6907	25.5959	10.5450	3.1142	0.0000	0.0000	0.0000	0.0000	8.6822	30.4885	59.3284	(98a)
Space heating requirement - total per year (kWh/year)												231.4097	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	55.9646	37.6907	25.5959	10.5450	3.1142	0.0000	0.0000	0.0000	0.0000	8.6822	30.4885	59.3284	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												231.4097	
Space heating per m2											(98c) / (4) =	6.0945	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	55.9646	37.6907	25.5959	10.5450	3.1142	0.0000	0.0000	0.0000	0.0000	8.6822	30.4885	59.3284	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	55.9646	37.6907	25.5959	10.5450	3.1142	0.0000	0.0000	0.0000	0.0000	8.6822	30.4885	59.3284	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	178.5190	157.7122	167.0778	145.7099	140.4542	125.6937	123.3899	128.7532	130.6854	146.7709	157.3532	176.4077	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month	55.0102	48.5986	51.4846	44.9001	43.2806	38.7322	38.0223	39.6750	40.2704	45.2271	48.4880	54.3596	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	11.3091	10.2147	11.3091	10.9443	11.3091	10.9443	11.3091	11.3091	10.9443	11.3091	10.9443	11.3091	(231)
Lighting	13.5004	10.8306	9.7517	7.1445	5.5186	4.5088	5.0343	6.5438	8.4997	11.1521	12.5962	13.8757	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	231.4097	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	324.5200	
Water heating fuel used	548.0485	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.2180)		
mechanical ventilation fans (SFP = 1.2180)	133.1557	(230a)
Total electricity for the above, kWh/year	133.1557	(231)
Electricity for lighting (calculated in Appendix L)	108.9563	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	1021.5703	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	231.4097	16.4900	38.1595	(240)
Space heating - main system 2	0.0000	16.4900	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	548.0485	16.4900	90.3732	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	133.1557	16.4900	21.9574	(249)
Energy for lighting	108.9563	16.4900	17.9669	(250)
Additional standing charges			0.0000	(251)
Total energy cost			168.4569	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.7309	(257)
SAP value		88.1518	
SAP rating (Section 12)		88	(258)
SAP band		B	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	231.4097	0.1575	36.4430	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	548.0485	0.1411	77.3114	(264)
Space and water heating			113.7545	(265)
Pumps, fans and electric keep-hot	133.1557	0.1387	18.4703	(267)
Energy for lighting	108.9563	0.1443	15.7258	(268)
Total CO2, kg/year			147.9506	(272)
CO2 emissions per m2			3.9000	(273)
EI value			97.6105	
EI rating			98	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		37.9700	(1b)	x 2.3600	(2b) =	89.6092	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	37.9700						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		89.6092	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.3400	(17)
Infiltration rate		0.1170	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.0994	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.6000	4.5000	4.5000	4.1000	4.2000	3.7000	3.5000	3.5000	3.7000	4.1000	4.1000	4.2000	(22)
Wind factor	1.1500	1.1250	1.1250	1.0250	1.0500	0.9250	0.8750	0.8750	0.9250	1.0250	1.0250	1.0500	(22a)
Adj infilt rate	0.1144	0.1119	0.1119	0.1019	0.1044	0.0920	0.0870	0.0870	0.0920	0.1019	0.1019	0.1044	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	80.1000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2139	0.2114	0.2114	0.2014	0.2039	0.1915	0.1865	0.1865	0.1915	0.2014	0.2014	0.2039	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door			2.1500	0.7800	1.6770			(26)
Window			4.4700	0.7282	3.2549			(27)
GF			37.9700	0.0900	3.4173	75.0000	2847.7500	(28a)
Main	38.8100	6.2200	32.1900	0.1300	4.1847	9.0000	289.7100	(29a)
Total net area of external elements Aum(A, m2)			76.7800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		12.5339			(33)
Main dwelling								
Party Wall 1			27.2200	0.0000	0.0000	20.0000	544.4000	(32)
Party Ceiling			37.9700			30.0000	1139.1000	(32b)
Timber			50.4000			9.0000	453.6000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 5274.5600 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	138.9139 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	5.1000	0.1150	0.5865
E3 Sill	5.1000	0.0170	0.0867
E4 Jamb	10.8000	0.0940	1.0152
E5 Ground floor (normal)	15.4000	0.0670	1.0318
E7 Party floor between dwellings (in blocks of flats)	15.4000	0.0320	0.4928
E16 Corner (normal)	12.6000	0.0680	0.8568
E17 Corner (inverted - internal area greater than external area)	2.5200	-0.0290	-0.0731
P1 Party wall - Ground floor	10.8000	0.0560	0.6048
E18 Party wall between dwellings	2.5200	0.2400	0.6048
E25 Staggered party wall between dwellings	5.0400	0.0560	0.2822

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	5.4886 (36)
Point Thermal bridges	(36a) = 0.0000
Total fabric heat loss	(33) + (36) + (36a) = 18.0224 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	6.3243	6.2508	6.2508	5.9567	6.0302	5.6626	5.5156	5.5156	5.6626	5.9567	5.9567	6.0302	(38)
Heat transfer coeff	24.3467	24.2732	24.2732	23.9791	24.0526	23.6850	23.5380	23.5380	23.6850	23.9791	23.9791	24.0526	(39)
Average = Sum(39)m / 12 =												23.9485	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6412	0.6393	0.6393	0.6315	0.6335	0.6238	0.6199	0.6199	0.6238	0.6315	0.6315	0.6335	(40)
HLP (average)												0.6307	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.3535 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
46.9130	46.2079	45.1806	43.2150	41.7644	40.1467	39.2272	40.2468	41.3644	43.1013	45.1092	46.7332	(42a)

Hot water usage for baths

20.2973	19.9959	19.5714	18.7887	18.2026	17.5528	17.2017	17.6233	18.0822	18.7776	19.5764	20.2287	(42b)

Hot water usage for other uses

28.4911	27.4550	26.4190	25.3830	24.3469	23.3109	23.3109	24.3469	25.3830	26.4190	27.4550	28.4911	(42c)

Average daily hot water use (litres/day)	87.9720 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	95.7014	93.6589	91.1710	87.3866	84.3139	81.0104	79.7399	82.2170	84.8296	88.2979	92.1406	95.4530	(44)
Energy conte	151.5676	133.3690	140.1264	119.6279	113.5028	99.6117	96.4385	101.8018	104.6034	119.8195	131.2712	149.4563	(45)
Energy content (annual)										Total = Sum(45)m =		1461.1961	
Distribution loss (46)m = 0.15 x (45)m	22.7351	20.0053	21.0190	17.9442	17.0254	14.9418	14.4658	15.2703	15.6905	17.9729	19.6907	22.4185	(46)

Water storage loss:	
Store volume	200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):	1.6100 (48)
Temperature factor from Table 2b	0.5400 (49)
Enter (49) or (54) in (55)	0.8694 (55)

Total storage loss

26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)

If cylinder contains dedicated solar storage

26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

178.5190	157.7122	167.0778	145.7099	140.4542	125.6937	123.3899	128.7532	130.6854	146.7709	157.3532	176.4077	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

178.5190	157.7122	167.0778	145.7099	140.4542	125.6937	123.3899	128.7532	130.6854	146.7709	157.3532	176.4077	(64)

Total per year (kWh/year) = Sum(64)m = 1778.5271 (64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

50.3962	44.3452	46.5920	39.7763	37.7397	33.1209	32.0658	33.8491	34.7806	39.8400	43.6477	49.6942	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	81.2094	81.2094	81.2094	81.2094	81.2094	81.2094	81.2094	81.2094	81.2094	81.2094	81.2094	81.2094	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

15.4239	13.6994	11.1411	8.4345	6.3049	5.3229	5.7515	7.4761	10.0344	12.7409	14.8705	15.8526	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

173.8268	175.6306	171.0851	161.4084	149.1932	137.7127	130.0430	128.2392	132.7847	142.4614	154.6766	166.1571	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

44.4744	44.4744	44.4744	44.4744	44.4744	44.4744	44.4744	44.4744	44.4744	44.4744	44.4744	44.4744	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	(71)

Water heating gains (Table 5)

67.7369	65.9899	62.6237	55.2449	50.7254	46.0012	43.0992	45.4961	48.3064	53.5483	60.6218	66.7933	(72)

Total internal gains

328.5318	326.8640	316.3941	296.6319	277.7677	260.5810	250.4379	252.7556	262.6697	280.2949	301.7131	320.3472	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	1.6600	8.9975	0.3800	0.0000	0.7700	4.3702	(74)
South	2.8100	39.5594	0.3800	0.0000	0.7700	32.5260	(78)

Solar gains 36.8962	64.7331	90.9045	112.0885	121.8862	123.2561	116.4763	105.4977	98.5135	73.6174	45.6405	33.9477	(83)
Total gains 365.4280	391.5971	407.2986	408.7205	399.6539	383.8371	366.9142	358.2533	361.1831	353.9123	347.3536	354.2950	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	60.1788	60.3611	60.3611	61.1014	60.9146	61.8600	62.2465	62.2465	61.8600	61.1014	61.1014	60.9146	
alpha	5.0119	5.0241	5.0241	5.0734	5.0610	5.1240	5.1498	5.1498	5.1240	5.0734	5.0734	5.0610	
util living area	0.8661	0.8225	0.7610	0.6509	0.5140	0.3688	0.2820	0.2953	0.4482	0.6545	0.8046	0.8764	(86)
MIT	20.5920	20.7002	20.8113	20.9261	20.9804	20.9972	20.9994	20.9993	20.9921	20.9340	20.7746	20.5727	(87)
Th 2	20.3931	20.3948	20.3948	20.4017	20.4000	20.4086	20.4121	20.4121	20.4086	20.4017	20.4017	20.4000	(88)
util rest of house	0.8517	0.8051	0.7396	0.6235	0.4808	0.3329	0.2444	0.2569	0.4111	0.6229	0.7835	0.8628	(89)
MIT 2	19.9315	20.0615	20.1914	20.3273	20.3826	20.4066	20.4118	20.4117	20.4024	20.3376	20.1584	19.9145	(90)

Living area fraction fLA = Living area / (4) = 0.4772 (91)

MIT	20.2467	20.3663	20.4872	20.6130	20.6679	20.6884	20.6922	20.6921	20.6838	20.6222	20.4525	20.2286	(92)

Temperature adjustment 0.0000

adjusted MIT	20.2467	20.3663	20.4872	20.6130	20.6679	20.6884	20.6922	20.6921	20.6838	20.6222	20.4525	20.2286	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8480	0.8042	0.7429	0.6333	0.4957	0.3499	0.2623	0.2752	0.4284	0.6347	0.7854	0.8587	(94)
Useful gains	309.8731	314.9331	302.5925	258.8433	198.1160	134.3211	96.2503	98.5802	154.7325	224.6273	272.7963	304.2360	(95)
Ext temp.	4.7000	5.3000	6.7000	9.3000	12.3000	15.0000	16.6000	16.5000	14.1000	10.8000	7.5000	4.6000	(96)

Heat loss rate W

378.5099	365.7060	334.6597	271.2763	201.2692	134.7309	96.3228	98.6737	155.9373	235.5276	310.5892	375.9081	(97)

Space heating kWh

51.0658	34.1194	23.8580	8.9518	2.3460	0.0000	0.0000	0.0000	0.0000	8.1099	27.2109	53.3240	(98a)

Space heating requirement - total per year (kWh/year) 208.9857

Solar heating kWh

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)

Solar heating contribution - total per year (kWh/year) 0.0000

Space heating kWh

51.0658	34.1194	23.8580	8.9518	2.3460	0.0000	0.0000	0.0000	0.0000	8.1099	27.2109	53.3240	(98c)

Space heating requirement after solar contribution - total per year (kWh/year) 208.9857

Space heating per m2 (98c) / (4) = 5.5040 (99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (201)

Fraction of space heat from main system(s)	1.0000 (202)
Fraction of main heating from main system 2	0.0000 (203)
Fraction of total heating from main system 1	1.0000 (204)
Fraction of total heating from main system 2	0.0000 (205)
Efficiency of main space heating system 1 (in %)	100.0000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	51.0658	34.1194	23.8580	8.9518	2.3460	0.0000	0.0000	0.0000	0.0000	8.1099	27.2109	53.3240	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	51.0658	34.1194	23.8580	8.9518	2.3460	0.0000	0.0000	0.0000	0.0000	8.1099	27.2109	53.3240	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	178.5190	157.7122	167.0778	145.7099	140.4542	125.6937	123.3899	128.7532	130.6854	146.7709	157.3532	176.4077	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month	55.0102	48.5986	51.4846	44.9001	43.2806	38.7322	38.0223	39.6750	40.2704	45.2271	48.4880	54.3596	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	11.3091	10.2147	11.3091	10.9443	11.3091	10.9443	11.3091	11.3091	10.9443	11.3091	10.9443	11.3091	(231)
Lighting	13.5004	10.8306	9.7517	7.1445	5.5186	4.5088	5.0343	6.5438	8.4997	11.1521	12.5962	13.8757	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year	
Space heating fuel - main system 1	208.9857 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	324.5200
Water heating fuel used	548.0485 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.2180)	
mechanical ventilation fans (SFP = 1.2180)	133.1557 (230a)
Total electricity for the above, kWh/year	133.1557 (231)
Electricity for lighting (calculated in Appendix L)	108.9563 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	0.0000 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	999.1463 (238)

10a. Fuel costs - using BEDF prices (583)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	208.9857	28.4300	59.4146	(240)
Space heating - main system 2	0.0000	28.4300	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	548.0485	28.4300	155.8102	(247)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(247a)
Pumps, fans and electric keep-hot	133.1557	28.4300	37.8562	(249)
Energy for lighting	108.9563	28.4300	30.9763	(250)
Additional standing charges			0.0000	(251)
Total energy cost			284.0573	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	208.9857	0.1576	32.9265	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	548.0485	0.1411	77.3114	(264)
Space and water heating			110.2379	(265)
Pumps, fans and electric keep-hot	133.1557	0.1387	18.4703	(267)
Energy for lighting	108.9563	0.1443	15.7258	(268)
Total CO2, kg/year			144.4340	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	208.9857	1.5833	330.8772	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	548.0485	1.5216	833.9227	(278)
Space and water heating			1164.7999	(279)
Pumps, fans and electric keep-hot	133.1557	1.5128	201.4379	(281)
Energy for lighting	108.9563	1.5338	167.1209	(282)
Total Primary energy kWh/year			1533.3587	(286)

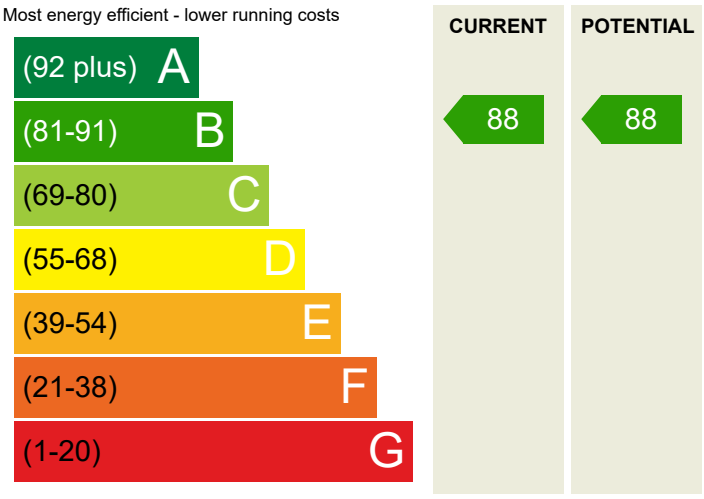
Energy Report

Dwelling Address	8 Shepherd Street, MANCHESTER, M9 4QW
Reference	78449-21-001
Assessment Date	02/07/2025
Submission Date	18/08/2025
Property Type	Flat, Mid-Terrace
Total Floor Area	38

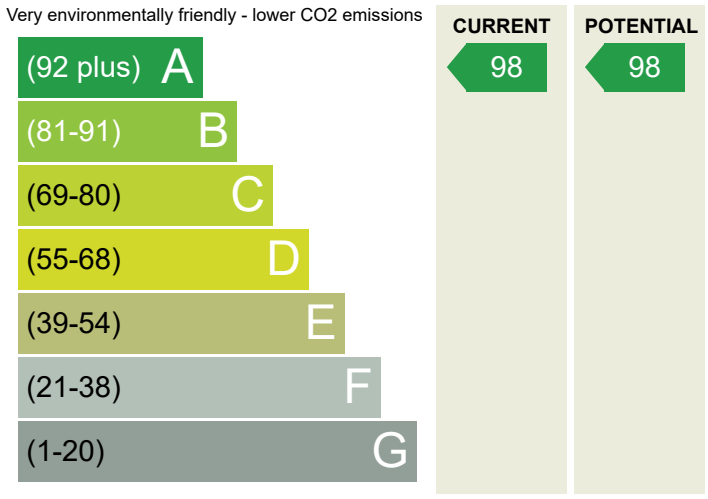
This Energy Report has been generated using the UK's National Calculation Methodology for dwellings, Standard Assessment Procedure (SAP). This methodology is used to assess the energy efficiency of dwellings which is calculated based on a dwelling's heating, hot water, ventilation and lighting usage.

This document is not an Energy Performance Certificate (EPC) as required by the Energy Performance of Buildings Regulations

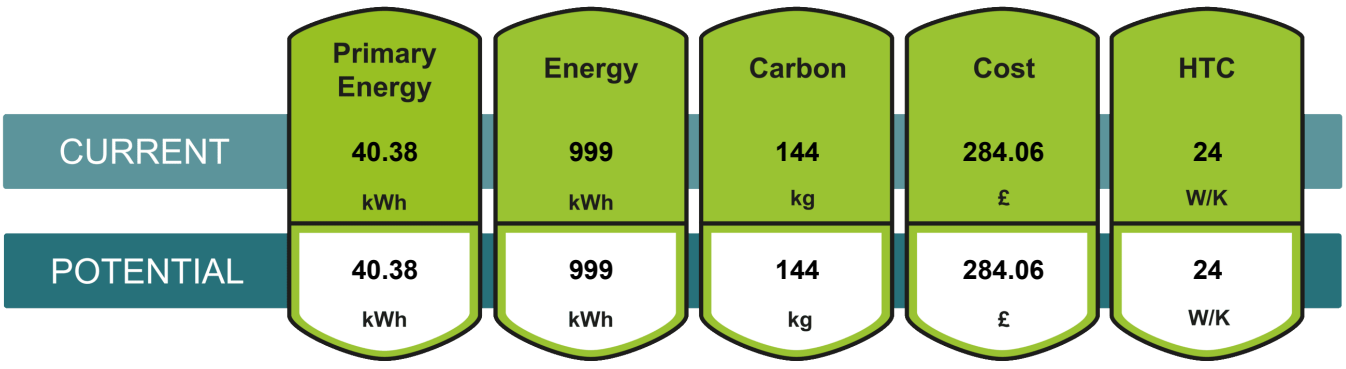
Energy Efficiency Rating



Carbon Dioxide (CO2) Emissions Rating



Additional ratings for your home



Energy Report

Breakdown of property's energy performance

Each feature is assessed as one of the following:

Very Poor	Poor	Average	Good	Very Good

Feature	Description	Energy Performance
Walls	Average thermal transmittance 0.13 W/m²K	Very Good
Floor	Average thermal transmittance 0.09 W/m²K	Very Good
Windows	High performance glazing	Very Good
Main heating	Room heaters, electric	Very Poor
Main heating controls	Programmer and room thermostat	Good
Secondary heating	None	
Hot water	From main system	Very Good
Lighting	Good lighting efficiency	Good
Air tightness	Air permeability [AP50] = 2.3 m³/h.m² (as tested)	Very Good

Recommendations

The recommended measures provided below will help to improve the energy efficiency of the dwelling.
To reach the dwelling's potential energy rating all of the recommended measures shown below would need to be installed.
Having these measures installed individually or in any other order may give a different result when compared with the cumulative potential rating.

Recommended measures	Cumulative savings (per year)	Cumulative rating	Typical costs	Incremental savings (per year)	Cumulative CO2 rating

The typical cost is based on average installation prices across the country so may not be representative of the actual costs in your area.

Estimated energy costs of the dwelling

Energy Report

The table below shows the estimated running costs of the space and water heating and lighting within the dwelling. It does not include the energy used from household appliances. The estimated annual costs after potential improvements indicates the total energy cost if all recommended measures named above were installed.

	Estimated annual costs	Estimated annual costs after potential improvements	Potential future savings
Lighting	£31	£31	
Heating	£97	£97	
Hot Water	£156	£156	
New Technologies e.g. Impact of PV	£0	£0	
TOTAL	£284	£284	

Estimated energy use and potential savings

Space Heating
209
kWh per year

Water Heating
548
kWh per year

About this document

Created by:	
Company/Trading name:	
Phone number:	
Email address:	

Disclaimer

This Energy Report should not under any circumstances be treated as a Condition Survey and cannot be used to indicate that any element of the dwelling (e.g.heating system) is working correctly.
This Energy Report must not be used in situations where an Energy Performance Certificate (EPC) is required.
This Energy Report is generated from a set of data inputs which may not reflect the actual dimensions, services or construction of the dwelling.
The calculation used to generate this report reflects the SAP Methodology current at the time of report generation.

Glossary terms for additional metrics

Primary Energy	The measure of the energy required for lighting, heating and hot water in a property. This includes the efficiency of the property's heating system, power station efficiency for electricity and the energy used to produce the fuel and deliver it to the property.
Energy Used	The estimated amount of fuel energy for lighting, heating and hot water for the property. The estimate is based on typical usage which is likely to be different to actual consumption.
Carbon (CO2)	The current emissions based on the energy estimates.
Cost	The estimated cost of energy. The cost of each unit of fuel is based on an industry standard which is likely to be different to those the occupier actually pays.
Heat Transfer Coefficient	Heat flow through the property envelope where internal and external temperatures are different.

Building Regulations England Part L (BREL) Compliance Report

Approved Document L1 2021 Edition, England assessed by Array SAP 10 program, Array

Date: Fri 03 Oct 2025 15:03:30

Project Information			
Assessed By	Paul Goddard	Building Type	Flat, Mid-terrace
OCDEA Registration	EES/005113	Assessment Date	2025-10-03

Dwelling Details			
Assessment Type	As built	Total Floor Area	49 m^2
Site Reference	78449-22	Plot Reference	001
Address	6 Shepherd Street, MANCHESTER, M9 4QW		

Client Details	
Name	-
Company	John Southworth
Address	Unit 10, Charles Street, DUKINFIELD, SK16 4SD

This report covers items included within the SAP calculations. It is not a complete report of regulations compliance.

1a Target emission rate and dwelling emission rate		
Fuel for main heating system	Electricity	
Target carbon dioxide emission rate	*14.63 $kgCO_2/m^2$*	
Dwelling carbon dioxide emission rate	5.67 $kgCO_2/m^2$	OK
1b Target primary energy rate and dwelling primary energy		
Target primary energy	*77.24 kWh_{PE}/m^2*	
Dwelling primary energy	59.36 kWh_{PE}/m^2	OK
1c Target fabric energy efficiency and dwelling fabric energy efficiency		
Target fabric energy efficiency	*38.1 kWh/m^2*	
Dwelling fabric energy efficiency	35.4 kWh/m^2	OK

2a Fabric U-values				
Element	***Maximum permitted average U-Value [W/m^2K]***	**Dwelling average U-Value [W/m^2K]**	**Element with highest individual U-Value**	
External walls	*0.26*	0.13	Walls (1) (0.13)	OK
Party walls	*0.2*	0	Party Wall (1) (0)	**N/A**
Curtain walls	*1.6*	0	N/A	**N/A**
Floors	*0.18*	0.11	Exposed Floor (0.14)	OK
Roofs	*0.16*	0.11	Roof (2) (0.12)	OK
Windows, doors, and roof windows	*1.6*	0.76	Front (0.78)	OK
Rooflights	*2.2*	N/A	N/A	**N/A**

2b Envelope elements (better than typically expected values are flagged with a subsequent (!))		
Name	**Net area [m^2]**	**U-Value [W/m^2K]**
Exposed wall: Walls (1)	47.86	0.13 **(!)**
Party wall: Party Wall (1)	39.02	0 **(!)**
Ground floor: GF, GF	3.02	0.09 **(!)**
Party floor: Exposed Floor, Exposed Floor	1.61	0.14
Exposed roof: Roof (1)	45.85	0.11
Exposed roof: Roof (2)	3.02	0.12

2c Openings (better than typically expected values are flagged with a subsequent (!))				
Name	**Area [m^2]**	**Orientation**	**Frame factor**	**U-Value [W/m^2K]**
Front, Door	2.15	South	N/A	0.78 **(!)**
Front, Window	2.05	South	1.0	0.75 **(!)**
Rear, Window	2.86	North	1.0	0.75 **(!)**

2d Thermal bridging (better than typically expected values are flagged with a subsequent (!))				
Building part **1**: Thermal bridging calculated from linear thermal transmittances for each junction				
Main element	**Junction detail**	**Source**	**Psi value [W/mK]**	**Drawing / reference**
External wall	E2: Other lintels (including other steel lintels)	Calculated by person with suitable expertise	0.115	Thermal Bridge Report
External wall	E3: Sill	Calculated by person with suitable	0.017 **(!)**	Thermal Bridge

Main element	Junction detail	Source	Psi value [W/mK]	Drawing / reference
		expertise		Report
External wall	E4: Jamb	Calculated by person with suitable expertise	0.094	Thermal Bridge Report
External wall	E5: Ground floor (normal)	Calculated by person with suitable expertise	0.067	Thermal Bridge Report
External wall	E7: Party floor between dwellings (in blocks of flats)	Calculated by person with suitable expertise	0.032 **(!)**	Thermal Bridge Report
External wall	E16: Corner (normal)	Calculated by person with suitable expertise	0.068	Thermal Bridge Report
External wall	E17: Corner (inverted - internal area greater than external area)	Calculated by person with suitable expertise	-0.029 **(!)**	Thermal Bridge Report
Party wall	P1: Ground floor	Calculated by person with suitable expertise	0.056	Thermal Bridge Report
External wall	E18: Party wall between dwellings	SAP table default	0.24	Thermal Bridge Report
External wall	E25: Staggered party wall between dwellings	Calculated by person with suitable expertise	0.056	Thermal Bridge Report
External wall	E20: Exposed floor (normal)	SAP table default	0.32	K1
External wall	E21: Exposed floor (inverted)	SAP table default	0.32	K1
External wall	E6: Intermediate floor within a dwelling	Calculated by person with suitable expertise	0.032 **(!)**	Thermal Bridge Report
External wall	E10: Eaves (insulation at ceiling level)	Calculated by person with suitable expertise	0.042	TRISCO
External wall	E12: Gable (insulation at ceiling level)	Calculated by person with suitable expertise	0.077	Thermal Bridge Report
External wall	E14: Flat roof	Calculated by person with suitable expertise	0.205	Thermal Bridge Report
External wall	E24: Eaves (insulation at ceiling level - inverted)	SAP table default	0.15	K1
Party wall	P4: Roof (insulation at ceiling level)	Calculated by person with suitable expertise	0.102	Thermal Bridge Report
Party wall	P5: Roof (insulation at rafter level)	SAP table default	0.48	K1

3 Air permeability (better than typically expected values are flagged with a subsequent (!))		
Maximum permitted air permeability at 50Pa	*8 m^3/hm^2*	
Dwelling air permeability at 50Pa	2.67 m^3/hm^2, Measured value **(!)**	OK
Air permeability test certificate reference		

4 Space heating	
Main heating system 1: Room heaters - Electricity	
Efficiency	100.0%
Emitter type	
Flow temperature	
System type	Panel, convector or radiant heaters
Manufacturer	
Model	
Commissioning	
Main heating system 2: Heat pump with radiators or underfloor heating - Electricity	
Efficiency	0.0%
Emitter type	
Flow temperature	
System type	
Manufacturer	Vaillant Group UK Ltd
Model	aroSTOR 200ltr
Commissioning	
Secondary heating system: N/A	
Fuel	N/A
Efficiency	N/A
Commissioning	

5 Hot water		
Cylinder/store - type: N/A		
Capacity	N/A	
Declared heat loss	N/A	
Primary pipework insulated	N/A	
Manufacturer		
Model		
Commissioning		
Waste water heat recovery system 1 - type: N/A		
Efficiency		
Manufacturer		
Model		

6 Controls		
Main heating 1 - type: Programmer and room thermostats		
Function		
Ecodesign class		
Manufacturer		
Model		
Main heating 2 - type: Not applicable		
Function		
Ecodesign class		
Manufacturer		
Model		
Water heating - type: Cylinder thermostat and HW separately timed		
Manufacturer		
Model		

7 Lighting		
Minimum permitted light source efficacy	*75 lm/W*	
Lowest light source efficacy	75 lm/W	**OK**
External lights control	N/A	

8 Mechanical ventilation		
System type: Balanced whole-house mechanical ventilation with heat recovery		
Maximum permitted specific fan power	*1.5 W/(l/s)*	
Specific fan power	0.87 W/(l/s)	**OK**
Minimum permitted heat recovery efficiency	*73%*	
Heat recovery efficiency	89%	**OK**
Manufacturer/Model	DV96 Adroit	
Commissioning		

9 Local generation
N/A

10 Heat networks
N/A

11 Supporting documentary evidence	
Documentary evidence identified in 11.1 and 11.2 is needed to confirm the data values used for any calculations undertaken, manufacturer declarations made, and tests performed as reflected in this "As built" BREL Compliance Report are correct. 11.1 SAP Conventions, Appendix 1 (documentary evidence) schedules the minimum documentary evidence required. 11.2 Indicative photographic evidence of key stages during construction (guidance within Approved Document L, Volume 1 – Appendix B) that confirms the products identified in this BREL Compliance Report are used in this dwelling, and workmanship is of sufficient quality to support the calculated values claimed in 2a to 2d.	

12 Declarations

a. Assessor Declaration

This declaration by the assessor is confirmation that the contents of this BREL Compliance Report are a true and accurate reflection based upon the design and construction information submitted for this dwelling for the purpose of carrying out the assessment, and that the supporting documentary evidence (identified in 11.1 and 11.2) pursuant to Part L of the Building Regulations 2010 (as amended) has been reviewed in the course of preparing this BREL Compliance Report.	

Signed:	Assessor ID:
Name:	Date:

b. Client Declaration

This declaration by the client is confirmation that the dwelling has been constructed and completed according to the specifications set out in this BREL Compliance Report, and that photographic evidence of key stages, as described in 11.2, has been provided to the Assessor for this dwelling.	

Signed:	Organisation:
Name:	Date:

Full SAP Calculation Printout

Property Reference	78449-22	**Issued on Date**	03/10/2025
Assessment Reference	001	**Prop Type Ref**	Top Flat / Mid
Property	6 Shepherd Street, MANCHESTER, M9 4QW		

SAP Rating	81 B	**DER**	5.67	**TER**	14.63
Environmental	96 A	**% DER < TER**			61.24
CO_2 Emissions (t/year)	0.26	**DFEE**	35.42	**TFEE**	38.12
Compliance Check	See BREL	**% DFEE < TFEE**			7.09
% DPER < TPER	23.14	**DPER**	59.36	**TPER**	77.24

Assessor Details	Mr. Daniel Goddard	**Assessor ID**	CP52-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	3.0200 (1b)	x	2.8500 (2b)	=	8.6070	(1b) - (3b)
First floor	45.8500 (1c)	x	2.5200 (2c)	=	115.5420	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	48.8700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	124.1490	(5)

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2. Ventilation rate

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				m3 per hour	
Number of open chimneys			0 * 80 =	0.0000	(6a)
Number of open flues			0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire			0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler			0 * 20 =	0.0000	(6d)
Number of flues attached to other heater			0 * 35 =	0.0000	(6e)
Number of blocked chimneys			0 * 20 =	0.0000	(6f)
Number of intermittent extract fans			0 * 10 =	0.0000	(7a)
Number of passive vents			0 * 10 =	0.0000	(7b)
Number of flueless gas fires			0 * 40 =	0.0000	(7c)
				Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =			0.0000 / (5) =	0.0000	(8)
Pressure test				Yes	
Pressure Test Method				Blower Door	
Measured/design AP50				2.6700	(17)
Infiltration rate				0.1335	(18)
Number of sides sheltered				2	(19)
Shelter factor			(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =	0.1135	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1447	0.1418	0.1390	0.1248	0.1220	0.1078	0.1078	0.1050	0.1135	0.1220	0.1277	0.1333	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	80.1000	(23c)

Effective ac	0.2442	0.2413	0.2385	0.2243	0.2215	0.2073	0.2073	0.2045	0.2130	0.2215	0.2272	0.2328	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door			2.1500	0.7800	1.6770			(26)
Window			4.9100	0.7282	3.5752			(27)
GF			3.0200	0.0900	0.2718	75.0000	226.5000	(28a)
Exposed Floor			1.6100	0.1400	0.2254	20.0000	32.2000	(28b)
Main	54.9189	7.0600	47.8589	0.1300	6.2217	9.0000	430.7301	(29a)
PIJ	45.8500		45.8500	0.1100	5.0435	9.0000	412.6500	(30)
Flat	3.0200		3.0200	0.1200	0.3624	9.0000	27.1800	(30)
Total net area of external elements Aum(A, m2)			108.4189					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		17.3770			(33)
Main dwelling								
Party Wall 1			39.0200	0.0000	0.0000	20.0000	780.4000	(32)
Party Floor 1			37.9700			30.0000	1139.1000	(32d)
Timber			50.4000			9.0000	453.6000	(32c)
Internal Floor 1			6.2700			18.0000	112.8600	(32d)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 3615.2201 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 73.9763 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	5.1100	0.1150	0.5877
E3 Sill	5.1100	0.0170	0.0869
E4 Jamb	13.8000	0.0940	1.2972
E5 Ground floor (normal)	2.0100	0.0670	0.1347
E7 Party floor between dwellings (in blocks of flats)	16.9400	0.0320	0.5421
E16 Corner (normal)	10.0800	0.0680	0.6854
E17 Corner (inverted - internal area greater than external area)	7.5600	-0.0290	-0.2192
P1 Party wall - Ground floor	5.1000	0.0560	0.2856
E18 Party wall between dwellings	11.4000	0.2400	2.7360
E25 Staggered party wall between dwellings	10.0800	0.0560	0.5645
E20 Exposed floor (normal)	1.2700	0.3200	0.4064
E21 Exposed floor (inverted)	3.8100	0.3200	1.2192
E6 Intermediate floor within a dwelling	2.5800	0.0320	0.0826
E10 Eaves (insulation at ceiling level)	11.0600	0.0420	0.4645
E12 Gable (insulation at ceiling level)	8.4600	0.0770	0.6514
E14 Flat roof	2.0100	0.2050	0.4120
E24 Eaves (insulation at ceiling level - inverted)	2.0100	0.1500	0.3015
P4 Party wall - Roof (insulation at ceiling level)	9.8200	0.1020	1.0016
P5 Party wall - Roof (insulation at rafter level)	3.0000	0.4800	1.4400

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 12.6800 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 30.0570 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	10.0039	9.8877	9.7714	9.1903	9.0741	8.4930	8.4930	8.3767	8.7254	9.0741	9.3065	9.5390	(38)
Heat transfer coeff	40.0609	39.9447	39.8285	39.2473	39.1311	38.5500	38.5500	38.4338	38.7824	39.1311	39.3636	39.5960	(39)

Average = Sum(39)m / 12 = 39.2183

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8197	0.8174	0.8150	0.8031	0.8007	0.7888	0.7888	0.7864	0.7936	0.8007	0.8055	0.8102	(40)
HLP (average)												0.8025	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

---

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.6569 (42)
Hot water usage for mixer showers

52.0000	51.2186	50.0798	47.9010	46.2932	44.5001	43.4809	44.6110	45.8498	47.7751	50.0006	51.8008	(42a)

Hot water usage for baths

22.4849	22.1510	21.6808	20.8137	20.1645	19.4446	19.0557	19.5227	20.0311	20.8014	21.6863	22.4089	(42b)

Hot water usage for other uses

31.5982	30.4492	29.3001	28.1511	27.0021	25.8531	25.8531	27.0021	28.1511	29.3001	30.4492	31.5982	(42c)

Average daily hot water use (litres/day) 97.5150 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	106.0831	103.8187	101.0607	96.8659	93.4597	89.7977	88.3896	91.1358	94.0320	97.8766	102.1361	105.8079	(44)
Energy conte	168.0098	147.8365	155.3265	132.6045	125.8147	110.4167	106.8996	112.8451	115.9509	132.8176	145.5116	165.6696	(45)
Energy content (annual)										Total = Sum(45)m =		1619.7032	
Distribution loss (46)m = 0.15 x (45)m	25.2015	22.1755	23.2990	19.8907	18.8722	16.5625	16.0349	16.9268	17.3926	19.9226	21.8267	24.8504	(46)

Water storage loss:
Store volume 200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.6100 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.8694 (55)
Total storage loss

26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)

If cylinder contains dedicated solar storage

26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

194.9612	172.1797	182.2779	158.6865	152.7661	136.4987	133.8510	139.7965	142.0329	159.7690	171.5936	192.6210	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

194.9612	172.1797	182.2779	158.6865	152.7661	136.4987	133.8510	139.7965	142.0329	159.7690	171.5936	192.6210	(64)
									Total per year (kWh/year) = Sum(64)m =		1937.0342	(64)
12Total per year (kWh/year)											1937	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

55.8632	49.1556	51.6461	44.0910	41.8334	36.7136	35.5441	37.5210	38.5537	44.1619	48.3826	55.0851	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	86.2814	95.5258	86.2814	89.1574	86.2814	89.1574	86.2814	86.2814	89.1574	86.2814	89.1574	86.2814	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	144.2994	145.7968	142.0235	133.9905	123.8503	114.3199	107.9530	106.4556	110.2290	118.2620	128.4022	137.9326	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)	
Losses e.g. evaporation (negative values) (Table 5)	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	(71)
Water heating gains (Table 5)	75.0850	73.1483	69.4168	61.2375	56.2277	50.9911	47.7744	50.4314	53.5468	59.3573	67.1981	74.0392	(72)
Total internal gains	353.5191	362.3242	345.5749	332.2387	314.2126	302.3217	289.8621	291.0218	300.7865	311.7540	332.6110	346.1064	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	2.8600	10.6334	0.3000	0.0000	0.7700	7.0251	(74)
South	2.0500	46.7521	0.3000	0.0000	0.7700	22.1394	(78)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	29.1645	49.6839	68.9999	88.8447	103.7589	105.1931	100.4849	88.8145	75.6763	55.0894	34.9091	24.9869	(83)
Total gains	382.6836	412.0081	414.5749	421.0834	417.9715	407.5148	390.3469	379.8363	376.4628	366.8434	367.5201	371.0934	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	25.0675	25.1405	25.2138	25.5872	25.6631	26.0500	26.0500	26.1288	25.8939	25.6631	25.5116	25.3618	
alpha	2.6712	2.6760	2.6809	2.7058	2.7109	2.7367	2.7367	2.7419	2.7263	2.7109	2.7008	2.6908	
util living area	0.8895	0.8645	0.8354	0.7724	0.6782	0.5340	0.4083	0.4330	0.5982	0.7672	0.8546	0.8960	(86)
MIT	19.1192	19.3558	19.6738	20.1367	20.5353	20.8308	20.9404	20.9284	20.7543	20.2750	19.6568	19.0870	(87)
Th 2	20.2363	20.2383	20.2404	20.2507	20.2527	20.2630	20.2630	20.2651	20.2589	20.2527	20.2486	20.2445	(88)
util rest of house	0.8795	0.8524	0.8201	0.7504	0.6452	0.4858	0.3471	0.3724	0.5523	0.7411	0.8399	0.8865	(89)
MIT 2	18.0193	18.3157	18.7146	19.2918	19.7709	20.1114	20.2205	20.2121	20.0288	19.4682	18.7039	17.9845	(90)
Living area fraction									fLA = Living area / (4) =			0.3912	(91)
MIT	18.4496	18.7226	19.0899	19.6224	20.0699	20.3929	20.5022	20.4923	20.3126	19.7839	19.0767	18.4158	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.4496	18.7226	19.0899	19.6224	20.0699	20.3929	20.5022	20.4923	20.3126	19.7839	19.0767	18.4158	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8510	0.8241	0.7934	0.7299	0.6366	0.4946	0.3674	0.3916	0.5558	0.7230	0.8131	0.8585	(94)
Useful gains	325.6766	339.5315	328.9250	307.3611	266.0666	201.5546	143.4281	148.7536	209.2376	265.2150	298.8445	318.6019	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	566.8463	552.1395	501.4359	420.8249	327.5252	223.3153	150.4285	157.2833	240.9417	359.3746	471.4464	562.8906	(97)
Space heating kWh	179.4302	142.8726	128.3481	81.6940	45.7252	0.0000	0.0000	0.0000	0.0000	70.0547	124.2733	181.7509	(98a)
Space heating requirement - total per year (kWh/year)												954.1489	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	179.4302	142.8726	128.3481	81.6940	45.7252	0.0000	0.0000	0.0000	0.0000	70.0547	124.2733	181.7509	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												954.1489	
Space heating per m2										(98c) / (4) =		19.5242	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	179.4302	142.8726	128.3481	81.6940	45.7252	0.0000	0.0000	0.0000	0.0000	70.0547	124.2733	181.7509	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	179.4302	142.8726	128.3481	81.6940	45.7252	0.0000	0.0000	0.0000	0.0000	70.0547	124.2733	181.7509	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	194.9612	172.1797	182.2779	158.6865	152.7661	136.4987	133.8510	139.7965	142.0329	159.7690	171.5936	192.6210	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month	60.0768	53.0567	56.1685	48.8988	47.0745	42.0617	41.2458	43.0779	43.7671	49.2324	52.8761	59.3557	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	15.6682	14.1519	15.6682	15.1628	15.6682	15.1628	15.6682	15.6682	15.1628	15.6682	15.1628	15.6682	(231)
Lighting	17.2805	13.8631	12.4822	9.1450	7.0638	5.7712	6.4439	8.3760	10.8796	14.2746	16.1231	17.7608	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	954.1489	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	324.5200	
Water heating fuel used	596.8921	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.2180)		
mechanical ventilation fans (SFP = 1.2180)	184.4804	(230a)
Total electricity for the above, kWh/year	184.4804	(231)
Electricity for lighting (calculated in Appendix L)	139.4638	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	1874.9853	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	954.1489	0.1545	147.3801	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	596.8921	0.1411	84.2266	(264)
Space and water heating			231.6067	(265)
Pumps, fans and electric keep-hot	184.4804	0.1387	25.5897	(267)
Energy for lighting	139.4638	0.1443	20.1289	(268)
Total CO2, kg/year			277.3253	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			5.6700	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	954.1489	1.5719	1499.7866	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	596.8921	1.5218	908.3378	(278)
Space and water heating			2408.1244	(279)
Pumps, fans and electric keep-hot	184.4804	1.5128	279.0820	(281)
Energy for lighting	139.4638	1.5338	213.9142	(282)
Total Primary energy kWh/year			2901.1206	(286)
Dwelling Primary energy Rate (DPER)			59.3600	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)		
Main dwelling							
Ground floor	3.0200	(1b)	x 2.8500	(2b)	= 8.6070	(1b) - (3b)	
First floor	45.8500	(1c)	x 2.5200	(2c)	= 115.5420	(1c) - (3c)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	48.8700					(4)	
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)		= 124.1490	(5)	

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1611	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4111	(18)

Number of sides sheltered 2 (19)

Shelter factor (20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.3494 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4455	0.4368	0.4281	0.3844	0.3756	0.3320	0.3320	0.3232	0.3494	0.3756	0.3931	0.4106	(22b)
Effective ac	0.5992	0.5954	0.5916	0.5739	0.5706	0.5551	0.5551	0.5522	0.5611	0.5706	0.5773	0.5843	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			2.1500	1.0000	2.1500			(26)
TER Opening Type			4.9100	1.1450	5.6221			(27)
GF			3.0200	0.1300	0.3926			(28a)
Exposed Floor			1.6100	0.1300	0.2093			(28b)
Main	54.9189	7.0600	47.8589	0.1800	8.6146			(29a)
PIJ	45.8500		45.8500	0.1100	5.0435			(30)
Flat	3.0200		3.0200	0.1100	0.3322			(30)
Total net area of external elements Aum(A, m2)			108.4189					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	22.3643			(33)
Main dwelling								
Party Wall 1			39.0200	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 73.9763 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	5.1100	0.0500	0.2555
E3 Sill	5.1100	0.0500	0.2555
E4 Jamb	13.8000	0.0500	0.6900
E5 Ground floor (normal)	2.0100	0.1600	0.3216
E7 Party floor between dwellings (in blocks of flats)	16.9400	0.0700	1.1858
E16 Corner (normal)	10.0800	0.0900	0.9072
E17 Corner (inverted - internal area greater than external area)	7.5600	-0.0900	-0.6804
P1 Party wall - Ground floor	5.1000	0.0800	0.4080
E18 Party wall between dwellings	11.4000	0.0600	0.6840
E25 Staggered party wall between dwellings	10.0800	0.0600	0.6048
E20 Exposed floor (normal)	1.2700	0.3200	0.4064
E21 Exposed floor (inverted)	3.8100	0.3200	1.2192
E6 Intermediate floor within a dwelling	2.5800	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	11.0600	0.0600	0.6636
E12 Gable (insulation at ceiling level)	8.4600	0.0600	0.5076
E14 Flat roof	2.0100	0.0800	0.1608
E24 Eaves (insulation at ceiling level - inverted)	2.0100	0.2400	0.4824
P4 Party wall - Roof (insulation at ceiling level)	9.8200	0.1200	1.1784
P5 Party wall - Roof (insulation at rafter level)	3.0000	0.0800	0.2400

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.4904 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 31.8547 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	24.5506	24.3928	24.2380	23.5111	23.3751	22.7419	22.7419	22.6247	22.9858	23.3751	23.6502	23.9378	(38)
Heat transfer coeff	56.4054	56.2475	56.0927	55.3658	55.2298	54.5967	54.5967	54.4794	54.8406	55.2298	55.5049	55.7926	(39)
Average = Sum(39)m / 12 =												55.3652	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1542	1.1510	1.1478	1.1329	1.1301	1.1172	1.1172	1.1148	1.1222	1.1301	1.1358	1.1417	(40)
HLP (average)												1.1329	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.6569 (42)
Hot water usage for mixer showers

52.0000	51.2186	50.0798	47.9010	46.2932	44.5001	43.4809	44.6110	45.8498	47.7751	50.0006	51.8008	(42a)

Hot water usage for baths

22.4849	22.1510	21.6808	20.8137	20.1645	19.4446	19.0557	19.5227	20.0311	20.8014	21.6863	22.4089	(42b)

Hot water usage for other uses

31.5982	30.4492	29.3001	28.1511	27.0021	25.8531	25.8531	27.0021	28.1511	29.3001	30.4492	31.5982	(42c)

Average daily hot water use (litres/day) 97.5150 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	106.0831	103.8187	101.0607	96.8659	93.4597	89.7977	88.3896	91.1358	94.0320	97.8766	102.1361	105.8079	(44)
Energy conte	168.0098	147.8365	155.3265	132.6045	125.8147	110.4167	106.8996	112.8451	115.9509	132.8176	145.5116	165.6696	(45)
Energy content (annual)										Total = Sum(45)m =		1619.7032	
Distribution loss (46)m = 0.15 x (45)m	25.2015	22.1755	23.2990	19.8907	18.8722	16.5625	16.0349	16.9268	17.3926	19.9226	21.8267	24.8504	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	214.6047	189.9222	201.9214	177.6964	172.4096	155.5086	153.4945	159.4400	161.0427	179.4125	190.6035	212.2645	(62)
WWHRS	-23.7722	-21.0244	-22.0155	-18.2297	-16.9894	-14.5380	-13.6270	-14.4910	-15.0415	-17.7323	-20.0886	-23.3320	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	190.8324	168.8978	179.9059	159.4667	155.4202	140.9706	139.8675	144.9490	146.0012	161.6802	170.5149	188.9325	(64)

											Total per year (kWh/year) = Sum(64)m =	1947.4390	(64)
12Total per year (kWh/year)												1947	(64)
Electric shower(s)													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
											Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	0.0000	(64a)
Heat gains from water heating, kWh/month													
93.1392	82.8242	88.9220	80.1645	79.1093	72.7870	72.8200	74.7969	74.6271	81.4378	84.4561	92.3611	(65)	

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	83.9607	92.9565	83.9607	86.7594	83.9607	86.7594	83.9607	83.9607	86.7594	83.9607	86.7594	83.9607	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	144.2994	145.7968	142.0235	133.9905	123.8503	114.3199	107.9530	106.4556	110.2290	118.2620	128.4022	137.9326	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	(71)
Water heating gains (Table 5)													
	125.1871	123.2503	119.5188	111.3395	106.3297	101.0931	97.8764	100.5335	103.6488	109.4594	117.3001	124.1412	(72)
Total internal gains													
	404.3005	412.8569	396.3563	382.9427	364.9940	350.0257	337.6434	338.8031	348.4905	362.5354	383.3150	396.8878	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	2.8600	10.6334	0.6300	0.7000	0.7700	9.2941	(74)
South	2.0500	46.7521	0.6300	0.7000	0.7700	29.2905	(78)

Solar gains	38.5846	65.7319	91.2869	117.5415	137.2730	139.1704	132.9415	117.5016	100.1197	72.8833	46.1847	33.0577	(83)
Total gains	442.8851	478.5888	487.6432	500.4842	502.2670	489.1961	470.5849	456.3047	448.6102	435.4187	429.4998	429.9455	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	17.8038	17.8537	17.9030	18.1381	18.1827	18.3936	18.3936	18.4332	18.3118	18.1827	18.0926	17.9993	
alpha	2.1869	2.1902	2.1935	2.2092	2.2122	2.2262	2.2262	2.2289	2.2208	2.2122	2.2062	2.2000	
util living area													
	0.8882	0.8658	0.8380	0.7815	0.6964	0.5686	0.4473	0.4731	0.6291	0.7775	0.8563	0.8938	(86)
MIT	18.2906	18.5708	18.9961	19.6109	20.1826	20.6426	20.8510	20.8257	20.5188	19.8236	18.9908	18.2546	(87)
Th 2	19.9568	19.9594	19.9620	19.9740	19.9763	19.9868	19.9868	19.9888	19.9828	19.9763	19.9717	19.9670	(88)
util rest of house													
	0.8761	0.8514	0.8196	0.7549	0.6557	0.5054	0.3616	0.3889	0.5707	0.7460	0.8387	0.8822	(89)
MIT 2	16.8256	17.1755	17.7079	18.4720	19.1596	19.6856	19.8920	19.8725	19.5556	18.7426	17.7133	16.7852	(90)
Living area fraction										fLA = Living area / (4) =		0.3912	(91)
MIT	17.3987	17.7214	18.2119	18.9176	19.5599	20.0600	20.2672	20.2454	19.9324	19.1655	18.2131	17.3601	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.3987	17.7214	18.2119	18.9176	19.5599	20.0600	20.2672	20.2454	19.9324	19.1655	18.2131	17.3601	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8374	0.8122	0.7817	0.7230	0.6372	0.5103	0.3865	0.4115	0.5675	0.7167	0.8010	0.8442	(94)
Useful gains	370.8562	388.7163	381.1770	361.8284	320.0366	249.6411	181.8907	187.7491	254.5936	312.0780	344.0265	362.9643	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	738.8399	721.1705	656.9509	554.6318	434.0988	298.0999	200.2163	209.4976	319.8540	473.0720	616.8316	734.2333	(97)
Space heating kWh													
	273.7799	223.4093	205.1758	138.8184	84.8623	0.0000	0.0000	0.0000	0.0000	119.7795	196.4197	276.2242	(98a)
Space heating requirement - total per year (kWh/year)												1518.4691	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	273.7799	223.4093	205.1758	138.8184	84.8623	0.0000	0.0000	0.0000	0.0000	119.7795	196.4197	276.2242	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1518.4691	
Space heating per m2											(98c) / (4) =	31.0716	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	273.7799	223.4093	205.1758	138.8184	84.8623	0.0000	0.0000	0.0000	0.0000	119.7795	196.4197	276.2242	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	296.6196	242.0469	222.2923	150.3992	91.9418	0.0000	0.0000	0.0000	0.0000	129.7720	212.8057	299.2678	(211)
Space heating efficiency (main heating system 2)													

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement												
	190.8324	168.8978	179.9059	159.4667	155.4202	140.9706	139.8675	144.9490	146.0012	161.6802	170.5149	188.9325 (64)
Efficiency of water heater												79.8000 (216)
(217)m	84.8686	84.6879	84.3553	83.7503	82.7625	79.8000	79.8000	79.8000	79.8000	83.3971	84.3778	84.9104 (217)
Fuel for water heating, kWh/month												
	224.8564	199.4355	213.2717	190.4072	187.7907	176.6549	175.2725	181.6404	182.9589	193.8680	202.0851	222.5081 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	17.4454	13.9953	12.6012	9.2322	7.1312	5.8263	6.5053	8.4559	10.9834	14.4108	16.2769	17.9302 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-23.3763	-33.2150	-48.1234	-54.5780	-59.2929	-55.5592	-54.9444	-51.7045	-45.9768	-38.2780	-25.8198	-20.1857 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-12.4013	-26.1875	-52.2162	-78.6423	-104.1612	-104.6692	-103.3673	-87.3742	-63.8973	-37.4382	-16.5592	-9.7931 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year	
Space heating fuel - main system 1	1645.1452 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	79.8000
Water heating fuel used	2350.7494 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
Total electricity for the above, kWh/year	86.0000 (231)
Electricity for lighting (calculated in Appendix L)	140.7942 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-1207.7611 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	3014.9278 (238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1645.1452	0.2100	345.4805	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2350.7494	0.2100	493.6574	(264)
Space and water heating			839.1379	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	140.7942	0.1443	20.3210	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-511.0540	0.1344	-68.6798	
PV Unit electricity exported	-696.7070	0.1258	-87.6666	
Total			-156.3465	(269)
Total CO2, kg/year			715.0416	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.6300	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1645.1452	1.1300	1859.0141	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2350.7494	1.1300	2656.3468	(278)
Space and water heating			4515.3609	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	140.7942	1.5338	215.9548	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-511.0540	1.4967	-764.8772	
PV Unit electricity exported	-696.7070	0.4619	-321.7956	
Total			-1086.6729	(283)
Total Primary energy kWh/year			3774.7437	(286)
Target Primary Energy Rate (TPER)			77.2400	(287)

Full SAP Calculation Printout

Property Reference	78449-22	**Issued on Date**	03/10/2025
Assessment Reference	001	**Prop Type Ref**	Top Flat / Mid
Property	6 Shepherd Street, MANCHESTER, M9 4QW		

SAP Rating	81 B	**DER**	5.67	**TER**	14.63
Environmental	96 A	**% DER < TER**			61.24
CO_2 Emissions (t/year)	0.26	**DFEE**	35.42	**TFEE**	38.12
Compliance Check	See BREL	**% DFEE < TFEE**			7.09
% DPER < TPER	23.14	**DPER**	59.36	**TPER**	77.24

Assessor Details	Mr. Daniel Goddard	**Assessor ID**	CP52-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	3.0200 (1b)	x	2.8500 (2b)	=	8.6070	(1b) - (3b)
First floor	45.8500 (1c)	x	2.5200 (2c)	=	115.5420	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	48.8700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	124.1490	(5)

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2. Ventilation rate

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			m3 per hour	
Number of open chimneys		0 * 80 =	0.0000	(6a)
Number of open flues		0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000	(6d)
Number of flues attached to other heater		0 * 35 =	0.0000	(6e)
Number of blocked chimneys		0 * 20 =	0.0000	(6f)
Number of intermittent extract fans		2 * 10 =	20.0000	(7a)
Number of passive vents		0 * 10 =	0.0000	(7b)
Number of flueless gas fires		0 * 40 =	0.0000	(7c)
			Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		20.0000 / (5) =	0.1611	(8)
Pressure test			Yes	
Pressure Test Method			Blower Door	
Measured/design AP50			2.6700	(17)
Infiltration rate			0.2946	(18)
Number of sides sheltered			2	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.2504	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3193	0.3130	0.3067	0.2754	0.2692	0.2379	0.2379	0.2316	0.2504	0.2692	0.2817	0.2942	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0.0000	(23c)

Effective ac	0.5510	0.5490	0.5470	0.5379	0.5362	0.5283	0.5283	0.5268	0.5314	0.5362	0.5397	0.5433	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door			2.1500	0.7800	1.6770			(26)
Window			4.9100	0.7282	3.5752			(27)
GF			3.0200	0.0900	0.2718	75.0000	226.5000	(28a)
Exposed Floor			1.6100	0.1400	0.2254	20.0000	32.2000	(28b)
Main	54.9189	7.0600	47.8589	0.1300	6.2217	9.0000	430.7301	(29a)
PIJ	45.8500		45.8500	0.1100	5.0435	9.0000	412.6500	(30)
Flat	3.0200		3.0200	0.1200	0.3624	9.0000	27.1800	(30)
Total net area of external elements Aum(A, m2)			108.4189					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		17.3770			(33)
Main dwelling								
Party Wall 1			39.0200	0.0000	0.0000	20.0000	780.4000	(32)
Party Floor 1			37.9700			30.0000	1139.1000	(32d)
Timber			50.4000			9.0000	453.6000	(32c)
Internal Floor 1			6.2700			18.0000	112.8600	(32d)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	3615.2201 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		73.9763 (35)

List of Thermal Bridges

	K1 Element	Length	Psi-value	Total
E2	Other lintels (including other steel lintels)	5.1100	0.1150	0.5877
E3	Sill	5.1100	0.0170	0.0869
E4	Jamb	13.8000	0.0940	1.2972
E5	Ground floor (normal)	2.0100	0.0670	0.1347
E7	Party floor between dwellings (in blocks of flats)	16.9400	0.0320	0.5421
E16	Corner (normal)	10.0800	0.0680	0.6854
E17	Corner (inverted - internal area greater than external area)	7.5600	-0.0290	-0.2192
P1	Party wall - Ground floor	5.1000	0.0560	0.2856
E18	Party wall between dwellings	11.4000	0.2400	2.7360
E25	Staggered party wall between dwellings	10.0800	0.0560	0.5645
E20	Exposed floor (normal)	1.2700	0.3200	0.4064
E21	Exposed floor (inverted)	3.8100	0.3200	1.2192
E6	Intermediate floor within a dwelling	2.5800	0.0320	0.0826
E10	Eaves (insulation at ceiling level)	11.0600	0.0420	0.4645
E12	Gable (insulation at ceiling level)	8.4600	0.0770	0.6514
E14	Flat roof	2.0100	0.2050	0.4120
E24	Eaves (insulation at ceiling level - inverted)	2.0100	0.1500	0.3015
P4	Party wall - Roof (insulation at ceiling level)	9.8200	0.1020	1.0016
P5	Party wall - Roof (insulation at rafter level)	3.0000	0.4800	1.4400

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 12.6800 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 30.0570 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	22.5726	22.4916	22.4121	22.0388	21.9689	21.6438	21.6438	21.5836	21.7690	21.9689	22.1102	22.2579	(38)
Heat transfer coeff	52.6297	52.5486	52.4691	52.0958	52.0260	51.7008	51.7008	51.6406	51.8261	52.0260	52.1673	52.3150	(39)

Average = Sum(39)m / 12 = 52.0955

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0769	1.0753	1.0736	1.0660	1.0646	1.0579	1.0579	1.0567	1.0605	1.0646	1.0675	1.0705	(40)
HLP (average)												1.0660	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.6569 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

22.4849	22.1510	21.6808	20.8137	20.1645	19.4446	19.0557	19.5227	20.0311	20.8014	21.6863	22.4089	(42b)

Hot water usage for other uses

31.5982	30.4492	29.3001	28.1511	27.0021	25.8531	25.8531	27.0021	28.1511	29.3001	30.4492	31.5982	(42c)

Average daily hot water use (litres/day) 49.5727 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	54.0831	52.6002	50.9809	48.9648	47.1665	45.2976	44.9088	46.5247	48.1822	50.1015	52.1355	54.0071	(44)
Energy conte	85.6544	74.9019	78.3557	67.0304	63.4952	55.6987	54.3133	57.6074	59.4135	67.9873	74.2766	84.5621	(45)

Energy content (annual) Total = Sum(45)m = 823.2965

Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss:

Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

72.8063	63.6666	66.6024	56.9758	53.9710	47.3439	46.1663	48.9663	50.5015	57.7892	63.1351	71.8778	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

72.8063	63.6666	66.6024	56.9758	53.9710	47.3439	46.1663	48.9663	50.5015	57.7892	63.1351	71.8778	(64)

Total per year (kWh/year) = Sum(64)m = 699.8020 (64)

12Total per year (kWh/year) 700 (64)

Electric shower(s)

41.6433	37.1046	40.5168	38.6647	39.3902	37.5744	38.8269	39.3902	38.6647	40.5168	39.7549	41.6433	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 473.6907 (64a)

Heat gains from water heating, kWh/month

28.6124	25.1928	26.7798	23.9101	23.3403	21.2296	21.2483	22.0891	22.2915	24.5765	25.7225	28.3803	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	86.2814	95.5258	86.2814	89.1574	86.2814	89.1574	86.2814	86.2814	89.1574	86.2814	89.1574	86.2814	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	144.2994	145.7968	142.0235	133.9905	123.8503	114.3199	107.9530	106.4556	110.2290	118.2620	128.4022	137.9326	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	(71)
Water heating gains (Table 5)	38.4575	37.4893	35.9943	33.2085	31.3713	29.4855	28.5595	29.6897	30.9605	33.0329	35.7257	38.1455	(72)
Total internal gains	316.8917	326.6652	312.1525	304.2097	289.3563	280.8162	270.6472	270.2800	278.2002	285.4296	301.1386	310.2128	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a	g Specific data	FF Specific data	Access factor	Gains W

					W/m2	or Table 6b		or Table 6c		Table 6d			
North				2.8600	10.6334	0.3000		0.0000		0.7700		7.0251	(74)
South				2.0500	46.7521	0.3000		0.0000		0.7700		22.1394	(78)
Solar gains	29.1645	49.6839	68.9999	88.8447	103.7589	105.1931	100.4849	88.8145	75.6763	55.0894	34.9091	24.9869	(83)
Total gains	346.0562	376.3492	381.1524	393.0544	393.1152	386.0092	371.1321	359.0945	353.8765	340.5190	336.0477	335.1997	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	19.0810	19.1105	19.1394	19.2766	19.3024	19.4238	19.4238	19.4465	19.3769	19.3024	19.2502	19.1958	
alpha	2.2721	2.2740	2.2760	2.2851	2.2868	2.2949	2.2949	2.2964	2.2918	2.2868	2.2833	2.2797	
util living area	0.9234	0.9053	0.8845	0.8377	0.7642	0.6413	0.5166	0.5450	0.6998	0.8356	0.8993	0.9282	(86)
MIT	18.1471	18.4210	18.8361	19.4571	20.0596	20.5715	20.8161	20.7847	20.4353	19.6847	18.8343	18.0964	(87)
Th 2	20.0197	20.0211	20.0224	20.0287	20.0299	20.0353	20.0353	20.0364	20.0332	20.0299	20.0275	20.0250	(88)
util rest of house	0.9148	0.8947	0.8706	0.8163	0.7289	0.5807	0.4281	0.4591	0.6460	0.8101	0.8862	0.9201	(89)
MIT 2	17.4147	17.6841	18.0934	18.7020	19.2771	19.7429	19.9391	19.9184	19.6281	18.9288	18.0990	17.3684	(90)
Living area fraction									fLA = Living area / (4) =			0.3912	(91)
MIT	17.7013	17.9724	18.3840	18.9974	19.5832	20.0671	20.2822	20.2574	19.9439	19.2245	18.3867	17.6532	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.7013	17.9724	18.3840	18.9974	19.5832	20.0671	20.2822	20.2574	19.9439	19.2245	18.3867	17.6532	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8881	0.8663	0.8416	0.7892	0.7104	0.5828	0.4522	0.4802	0.6405	0.7848	0.8582	0.8942	(94)
Useful gains	307.3272	326.0201	320.7854	310.1881	279.2530	224.9841	167.8394	172.4431	226.6495	267.2427	288.4067	299.7258	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	705.3047	686.9357	623.5438	526.0331	410.1332	282.6546	190.3744	199.1972	302.8673	448.7006	588.7953	703.8047	(97)
Space heating kWh	296.0953	242.5353	225.2522	155.4084	97.3749	0.0000	0.0000	0.0000	0.0000	135.0047	216.2798	300.6347	(98a)
Space heating requirement - total per year (kWh/year)												1668.5853	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	296.0953	242.5353	225.2522	155.4084	97.3749	0.0000	0.0000	0.0000	0.0000	135.0047	216.2798	300.6347	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1668.5853	
Space heating per m2											(98c) / (4) =	34.1433	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	485.9880	382.5863	392.4689	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.6358	0.7076	0.6878	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	308.9791	270.7055	269.9557	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	410.3504	395.0265	382.7269	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	72.9873	92.4949	83.9017	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	18.2468	23.1237	20.9754	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												62.3460	(107)
Energy for space heating												34.1433	(99)
Energy for space cooling												1.2758	(108)
Total												35.4191	(109)
Fabric Energy Efficiency (DFEE)												35.4	(109)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	3.0200	(1b)	x 2.8500	(2b) =	8.6070	(1b) - (3b)
First floor	45.8500	(1c)	x 2.5200	(2c) =	115.5420	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	48.8700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		124.1490	(5)

2. Ventilation rate

m3 per hour

Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1611	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4111	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3494	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4455	0.4368	0.4281	0.3844	0.3756	0.3320	0.3320	0.3232	0.3494	0.3756	0.3931	0.4106	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5992	0.5954	0.5916	0.5739	0.5706	0.5551	0.5551	0.5522	0.5611	0.5706	0.5773	0.5843	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			2.1500	1.0000	2.1500			(26)
TER Opening Type			4.9100	1.1450	5.6221			(27)
GF			3.0200	0.1300	0.3926			(28a)
Exposed Floor			1.6100	0.1300	0.2093			(28b)
Main	54.9189	7.0600	47.8589	0.1800	8.6146			(29a)
PIJ	45.8500		45.8500	0.1100	5.0435			(30)
Flat	3.0200		3.0200	0.1100	0.3322			(30)
Total net area of external elements Aum(A, m2)			108.4189					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		22.3643			(33)
Main dwelling								
Party Wall 1			39.0200	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		73.9763	(35)
List of Thermal Bridges			

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	5.1100	0.0500	0.2555
E3 Sill	5.1100	0.0500	0.2555
E4 Jamb	13.8000	0.0500	0.6900
E5 Ground floor (normal)	2.0100	0.1600	0.3216
E7 Party floor between dwellings (in blocks of flats)	16.9400	0.0700	1.1858
E16 Corner (normal)	10.0800	0.0900	0.9072
E17 Corner (inverted - internal area greater than external area)	7.5600	-0.0900	-0.6804
P1 Party wall - Ground floor	5.1000	0.0800	0.4080
E18 Party wall between dwellings	11.4000	0.0600	0.6840
E25 Staggered party wall between dwellings	10.0800	0.0600	0.6048
E20 Exposed floor (normal)	1.2700	0.3200	0.4064
E21 Exposed floor (inverted)	3.8100	0.3200	1.2192
E6 Intermediate floor within a dwelling	2.5800	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	11.0600	0.0600	0.6636
E12 Gable (insulation at ceiling level)	8.4600	0.0600	0.5076
E14 Flat roof	2.0100	0.0800	0.1608
E24 Eaves (insulation at ceiling level - inverted)	2.0100	0.2400	0.4824
P4 Party wall - Roof (insulation at ceiling level)	9.8200	0.1200	1.1784
P5 Party wall - Roof (insulation at rafter level)	3.0000	0.0800	0.2400

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		9.4904	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	31.8547	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	24.5506	24.3928	24.2380	23.5111	23.3751	22.7419	22.7419	22.6247	22.9858	23.3751	23.6502	23.9378	(38)
Heat transfer coeff	56.4054	56.2475	56.0927	55.3658	55.2298	54.5967	54.5967	54.4794	54.8406	55.2298	55.5049	55.7926	(39)
Average = Sum(39)m / 12 =												55.3652	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1542	1.1510	1.1478	1.1329	1.1301	1.1172	1.1172	1.1148	1.1222	1.1301	1.1358	1.1417	(40)
HLP (average)												1.1329	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy		1.6569	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

22.4849	22.1510	21.6808	20.8137	20.1645	19.4446	19.0557	19.5227	20.0311	20.8014	21.6863	22.4089	(42b)

Hot water usage for other uses

31.5982	30.4492	29.3001	28.1511	27.0021	25.8531	25.8531	27.0021	28.1511	29.3001	30.4492	31.5982	(42c)

Average daily hot water use (litres/day)	49.5727	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	54.0831	52.6002	50.9809	48.9648	47.1665	45.2976	44.9088	46.5247	48.1822	50.1015	52.1355	54.0071	(44)
Energy conte	85.6544	74.9019	78.3557	67.0304	63.4952	55.6987	54.3133	57.6074	59.4135	67.9873	74.2766	84.5621	(45)
Energy content (annual)										Total = Sum(45)m =		823.2965	

Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss:
Total storage loss

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

	72.8063	63.6666	66.6024	56.9758	53.9710	47.3439	46.1663	48.9663	50.5015	57.7892	63.1351	71.8778 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)

Output from w/h

	72.8063	63.6666	66.6024	56.9758	53.9710	47.3439	46.1663	48.9663	50.5015	57.7892	63.1351	71.8778 (64)

Total per year (kWh/year) = Sum(64)m = 699.8020 (64)

12Total per year (kWh/year) 700 (64)

Electric shower(s)

	41.6433	37.1046	40.5168	38.6647	39.3902	37.5744	38.8269	39.3902	38.6647	40.5168	39.7549	41.6433 (64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 473.6907 (64a)

Heat gains from water heating, kWh/month

	28.6124	25.1928	26.7798	23.9101	23.3403	21.2296	21.2483	22.0891	22.2915	24.5765	25.7225	28.3803 (65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	83.9607	92.9565	83.9607	86.7594	83.9607	86.7594	83.9607	83.9607	86.7594	83.9607	86.7594	83.9607 (67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	144.2994	145.7968	142.0235	133.9905	123.8503	114.3199	107.9530	106.4556	110.2290	118.2620	128.4022	137.9326 (68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)

Losses e.g. evaporation (negative values) (Table 5)

	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755 (71)

Water heating gains (Table 5)

	38.4575	37.4893	35.9943	33.2085	31.3713	29.4855	28.5595	29.6897	30.9605	33.0329	35.7257	38.1455 (72)

Total internal gains

	314.5710	324.0959	309.8318	301.8117	287.0356	278.4181	268.3266	267.9593	275.8021	283.1089	298.7406	307.8921 (73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	2.8600	10.6334	0.6300	0.7000	0.7700	9.2941	(74)
South	2.0500	46.7521	0.6300	0.7000	0.7700	29.2905	(78)

Solar gains	38.5846	65.7319	91.2869	117.5415	137.2730	139.1704	132.9415	117.5016	100.1197	72.8833	46.1847	33.0577 (83)
Total gains	353.1556	389.8278	401.1187	419.3532	424.3086	417.5885	401.2680	385.4609	375.9218	355.9922	344.9253	340.9498 (84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	17.8038	17.8537	17.9030	18.1381	18.1827	18.3936	18.3936	18.4332	18.3118	18.1827	18.0926	17.9993	
alpha	2.1869	2.1902	2.1935	2.2092	2.2122	2.2262	2.2262	2.2289	2.2208	2.2122	2.2062	2.2000	
util living area													
	0.9235	0.9035	0.8799	0.8291	0.7515	0.6267	0.5039	0.5341	0.6918	0.8319	0.8987	0.9284	(86)
MIT	17.9586	18.2635	18.7203	19.3946	20.0286	20.5601	20.8093	20.7755	20.4078	19.6121	18.7033	17.9183	(87)
Th 2	19.9568	19.9594	19.9620	19.9740	19.9763	19.9868	19.9868	19.9888	19.9828	19.9763	19.9717	19.9670	(88)
util rest of house													
	0.9145	0.8923	0.8651	0.8062	0.7139	0.5634	0.4126	0.4452	0.6354	0.8051	0.8851	0.9200	(89)
MIT 2	17.1904	17.4907	17.9411	18.6037	19.2073	19.6918	19.8898	19.8689	19.5636	18.8229	17.9357	17.1572	(90)
Living area fraction									fLA = Living area / (4) =			0.3912	(91)
MIT	17.4910	17.7931	18.2459	18.9131	19.5286	20.0315	20.2495	20.2236	19.8939	19.1317	18.2360	17.4550	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.4910	17.7931	18.2459	18.9131	19.5286	20.0315	20.2495	20.2236	19.8939	19.1317	18.2360	17.4550	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8865	0.8622	0.8343	0.7778	0.6951	0.5664	0.4378	0.4674	0.6299	0.7785	0.8557	0.8929	(94)
Useful gains	313.0623	336.1263	334.6622	326.1880	294.9546	236.5380	175.6769	180.1632	236.7855	277.1433	295.1655	304.4277	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	744.0407	725.2031	658.8623	554.3845	432.3711	296.5418	199.2510	208.3068	317.7395	471.2035	618.1048	739.5317	(97)
Space heating kWh													
	320.6479	261.4596	241.2049	164.3015	102.2379	0.0000	0.0000	0.0000	0.0000	144.3807	232.5163	323.7174	(98a)

Space heating requirement - total per year (kWh/year) 1790.4662

Solar heating kWh

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)

Solar heating contribution - total per year (kWh/year) 0.0000

Space heating kWh

	320.6479	261.4596	241.2049	164.3015	102.2379	0.0000	0.0000	0.0000	0.0000	144.3807	232.5163	323.7174 (98c)

Space heating requirement after solar contribution - total per year (kWh/year) 1790.4662

Space heating per m2 (98c) / (4) = 36.6373 (99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	513.2088	404.0154	414.0437	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.6435	0.7134	0.6919	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	330.2576	288.2200	286.4756	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	449.8611	432.7434	415.9721	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	86.1146	107.5254	96.3454	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	21.5286	26.8814	24.0863	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												72.4963	(107)
Energy for space heating												36.6373	(99)
Energy for space cooling												1.4835	(108)
Total												38.1208	(109)
Fabric Energy Efficiency (TFEE)												38.1	(109)

Full SAP Calculation Printout

Property Reference	78449-22	**Issued on Date**	03/10/2025
Assessment Reference	001	**Prop Type Ref**	Top Flat / Mid
Property	6 Shepherd Street, MANCHESTER, M9 4QW		

SAP Rating	81 B	**DER**	5.67	**TER**	14.63
Environmental	96 A	**% DER < TER**			61.24
CO_2 Emissions (t/year)	0.26	**DFEE**	35.42	**TFEE**	38.12
Compliance Check	See BREL	**% DFEE < TFEE**			7.09
% DPER < TPER	23.14	**DPER**	59.36	**TPER**	77.24

Assessor Details	Mr. Daniel Goddard	**Assessor ID**	CP52-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	3.0200 (1b)	x	2.8500 (2b)	=	8.6070	(1b) - (3b)
First floor	45.8500 (1c)	x	2.5200 (2c)	=	115.5420	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	48.8700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	124.1490	(5)

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2. Ventilation rate

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				m3 per hour	
Number of open chimneys			0 * 80 =	0.0000	(6a)
Number of open flues			0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire			0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler			0 * 20 =	0.0000	(6d)
Number of flues attached to other heater			0 * 35 =	0.0000	(6e)
Number of blocked chimneys			0 * 20 =	0.0000	(6f)
Number of intermittent extract fans			0 * 10 =	0.0000	(7a)
Number of passive vents			0 * 10 =	0.0000	(7b)
Number of flueless gas fires			0 * 40 =	0.0000	(7c)
				Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =			0.0000 / (5) =	0.0000	(8)
Pressure test				Yes	
Pressure Test Method				Blower Door	
Measured/design AP50				2.6700	(17)
Infiltration rate				0.1335	(18)
Number of sides sheltered				2	(19)
Shelter factor			(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =	0.1135	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1447	0.1418	0.1390	0.1248	0.1220	0.1078	0.1078	0.1050	0.1135	0.1220	0.1277	0.1333	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	80.1000	(23c)

Effective ac	0.2442	0.2413	0.2385	0.2243	0.2215	0.2073	0.2073	0.2045	0.2130	0.2215	0.2272	0.2328	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door			2.1500	0.7800	1.6770			(26)
Window			4.9100	0.7282	3.5752			(27)
GF			3.0200	0.0900	0.2718	75.0000	226.5000	(28a)
Exposed Floor			1.6100	0.1400	0.2254	20.0000	32.2000	(28b)
Main	54.9189	7.0600	47.8589	0.1300	6.2217	9.0000	430.7301	(29a)
PIJ	45.8500		45.8500	0.1100	5.0435	9.0000	412.6500	(30)
Flat	3.0200		3.0200	0.1200	0.3624	9.0000	27.1800	(30)
Total net area of external elements Aum(A, m2)			108.4189					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		17.3770			(33)
Main dwelling								
Party Wall 1			39.0200	0.0000	0.0000	20.0000	780.4000	(32)
Party Floor 1			37.9700			30.0000	1139.1000	(32d)
Timber			50.4000			9.0000	453.6000	(32c)
Internal Floor 1			6.2700			18.0000	112.8600	(32d)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 3615.2201 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 73.9763 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	5.1100	0.1150	0.5877
E3 Sill	5.1100	0.0170	0.0869
E4 Jamb	13.8000	0.0940	1.2972
E5 Ground floor (normal)	2.0100	0.0670	0.1347
E7 Party floor between dwellings (in blocks of flats)	16.9400	0.0320	0.5421
E16 Corner (normal)	10.0800	0.0680	0.6854
E17 Corner (inverted - internal area greater than external area)	7.5600	-0.0290	-0.2192
P1 Party wall - Ground floor	5.1000	0.0560	0.2856
E18 Party wall between dwellings	11.4000	0.2400	2.7360
E25 Staggered party wall between dwellings	10.0800	0.0560	0.5645
E20 Exposed floor (normal)	1.2700	0.3200	0.4064
E21 Exposed floor (inverted)	3.8100	0.3200	1.2192
E6 Intermediate floor within a dwelling	2.5800	0.0320	0.0826
E10 Eaves (insulation at ceiling level)	11.0600	0.0420	0.4645
E12 Gable (insulation at ceiling level)	8.4600	0.0770	0.6514
E14 Flat roof	2.0100	0.2050	0.4120
E24 Eaves (insulation at ceiling level - inverted)	2.0100	0.1500	0.3015
P4 Party wall - Roof (insulation at ceiling level)	9.8200	0.1020	1.0016
P5 Party wall - Roof (insulation at rafter level)	3.0000	0.4800	1.4400

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 12.6800 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 30.0570 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	10.0039	9.8877	9.7714	9.1903	9.0741	8.4930	8.4930	8.3767	8.7254	9.0741	9.3065	9.5390	(38)
Heat transfer coeff	40.0609	39.9447	39.8285	39.2473	39.1311	38.5500	38.5500	38.4338	38.7824	39.1311	39.3636	39.5960	(39)

Average = Sum(39)m / 12 = 39.2183

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8197	0.8174	0.8150	0.8031	0.8007	0.7888	0.7888	0.7864	0.7936	0.8007	0.8055	0.8102	(40)
HLP (average)												0.8025	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.6569 (42)
Hot water usage for mixer showers

52.0000	51.2186	50.0798	47.9010	46.2932	44.5001	43.4809	44.6110	45.8498	47.7751	50.0006	51.8008	(42a)

Hot water usage for baths

22.4849	22.1510	21.6808	20.8137	20.1645	19.4446	19.0557	19.5227	20.0311	20.8014	21.6863	22.4089	(42b)

Hot water usage for other uses

31.5982	30.4492	29.3001	28.1511	27.0021	25.8531	25.8531	27.0021	28.1511	29.3001	30.4492	31.5982	(42c)

Average daily hot water use (litres/day) 97.5150 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	106.0831	103.8187	101.0607	96.8659	93.4597	89.7977	88.3896	91.1358	94.0320	97.8766	102.1361	105.8079	(44)
Energy conte	168.0098	147.8365	155.3265	132.6045	125.8147	110.4167	106.8996	112.8451	115.9509	132.8176	145.5116	165.6696	(45)
Energy content (annual)										Total = Sum(45)m =		1619.7032	
Distribution loss (46)m = 0.15 x (45)m	25.2015	22.1755	23.2990	19.8907	18.8722	16.5625	16.0349	16.9268	17.3926	19.9226	21.8267	24.8504	(46)

Water storage loss:
Store volume 200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.6100 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.8694 (55)
Total storage loss

26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)

If cylinder contains dedicated solar storage

26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

194.9612	172.1797	182.2779	158.6865	152.7661	136.4987	133.8510	139.7965	142.0329	159.7690	171.5936	192.6210	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

194.9612	172.1797	182.2779	158.6865	152.7661	136.4987	133.8510	139.7965	142.0329	159.7690	171.5936	192.6210	(64)
									Total per year (kWh/year) = Sum(64)m =		1937.0342	(64)
12Total per year (kWh/year)											1937	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

55.8632	49.1556	51.6461	44.0910	41.8334	36.7136	35.5441	37.5210	38.5537	44.1619	48.3826	55.0851	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	86.2814	95.5258	86.2814	89.1574	86.2814	89.1574	86.2814	86.2814	89.1574	86.2814	89.1574	86.2814	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	144.2994	145.7968	142.0235	133.9905	123.8503	114.3199	107.9530	106.4556	110.2290	118.2620	128.4022	137.9326	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)	
Losses e.g. evaporation (negative values) (Table 5)	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	(71)
Water heating gains (Table 5)	75.0850	73.1483	69.4168	61.2375	56.2277	50.9911	47.7744	50.4314	53.5468	59.3573	67.1981	74.0392	(72)
Total internal gains	353.5191	362.3242	345.5749	332.2387	314.2126	302.3217	289.8621	291.0218	300.7865	311.7540	332.6110	346.1064	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	2.8600	10.6334	0.3000	0.0000	0.7700	7.0251	(74)
South	2.0500	46.7521	0.3000	0.0000	0.7700	22.1394	(78)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	29.1645	49.6839	68.9999	88.8447	103.7589	105.1931	100.4849	88.8145	75.6763	55.0894	34.9091	24.9869	(83)
Total gains	382.6836	412.0081	414.5749	421.0834	417.9715	407.5148	390.3469	379.8363	376.4628	366.8434	367.5201	371.0934	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	25.0675	25.1405	25.2138	25.5872	25.6631	26.0500	26.0500	26.1288	25.8939	25.6631	25.5116	25.3618	
alpha	2.6712	2.6760	2.6809	2.7058	2.7109	2.7367	2.7367	2.7419	2.7263	2.7109	2.7008	2.6908	
util living area	0.8895	0.8645	0.8354	0.7724	0.6782	0.5340	0.4083	0.4330	0.5982	0.7672	0.8546	0.8960	(86)
MIT	19.1192	19.3558	19.6738	20.1367	20.5353	20.8308	20.9404	20.9284	20.7543	20.2750	19.6568	19.0870	(87)
Th 2	20.2363	20.2383	20.2404	20.2507	20.2527	20.2630	20.2630	20.2651	20.2589	20.2527	20.2486	20.2445	(88)
util rest of house	0.8795	0.8524	0.8201	0.7504	0.6452	0.4858	0.3471	0.3724	0.5523	0.7411	0.8399	0.8865	(89)
MIT 2	18.0193	18.3157	18.7146	19.2918	19.7709	20.1114	20.2205	20.2121	20.0288	19.4682	18.7039	17.9845	(90)
Living area fraction									fLA = Living area / (4) =			0.3912	(91)
MIT	18.4496	18.7226	19.0899	19.6224	20.0699	20.3929	20.5022	20.4923	20.3126	19.7839	19.0767	18.4158	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.4496	18.7226	19.0899	19.6224	20.0699	20.3929	20.5022	20.4923	20.3126	19.7839	19.0767	18.4158	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8510	0.8241	0.7934	0.7299	0.6366	0.4946	0.3674	0.3916	0.5558	0.7230	0.8131	0.8585	(94)
Useful gains	325.6766	339.5315	328.9250	307.3611	266.0666	201.5546	143.4281	148.7536	209.2376	265.2150	298.8445	318.6019	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	566.8463	552.1395	501.4359	420.8249	327.5252	223.3153	150.4285	157.2833	240.9417	359.3746	471.4464	562.8906	(97)
Space heating kWh	179.4302	142.8726	128.3481	81.6940	45.7252	0.0000	0.0000	0.0000	0.0000	70.0547	124.2733	181.7509	(98a)
Space heating requirement - total per year (kWh/year)												954.1489	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	179.4302	142.8726	128.3481	81.6940	45.7252	0.0000	0.0000	0.0000	0.0000	70.0547	124.2733	181.7509	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												954.1489	
Space heating per m2										(98c) / (4) =		19.5242	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	179.4302	142.8726	128.3481	81.6940	45.7252	0.0000	0.0000	0.0000	0.0000	70.0547	124.2733	181.7509	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	179.4302	142.8726	128.3481	81.6940	45.7252	0.0000	0.0000	0.0000	0.0000	70.0547	124.2733	181.7509	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	194.9612	172.1797	182.2779	158.6865	152.7661	136.4987	133.8510	139.7965	142.0329	159.7690	171.5936	192.6210	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month	60.0768	53.0567	56.1685	48.8988	47.0745	42.0617	41.2458	43.0779	43.7671	49.2324	52.8761	59.3557	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	15.6682	14.1519	15.6682	15.1628	15.6682	15.1628	15.6682	15.6682	15.1628	15.6682	15.1628	15.6682	(231)
Lighting	17.2805	13.8631	12.4822	9.1450	7.0638	5.7712	6.4439	8.3760	10.8796	14.2746	16.1231	17.7608	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	954.1489	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	324.5200	
Water heating fuel used	596.8921	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.2180)		
mechanical ventilation fans (SFP = 1.2180)	184.4804	(230a)
Total electricity for the above, kWh/year	184.4804	(231)
Electricity for lighting (calculated in Appendix L)	139.4638	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	1874.9853	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	954.1489	0.1545	147.3801	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	596.8921	0.1411	84.2266	(264)
Space and water heating			231.6067	(265)
Pumps, fans and electric keep-hot	184.4804	0.1387	25.5897	(267)
Energy for lighting	139.4638	0.1443	20.1289	(268)
Total CO2, kg/year			277.3253	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			5.6700	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	954.1489	1.5719	1499.7866	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	596.8921	1.5218	908.3378	(278)
Space and water heating			2408.1244	(279)
Pumps, fans and electric keep-hot	184.4804	1.5128	279.0820	(281)
Energy for lighting	139.4638	1.5338	213.9142	(282)
Total Primary energy kWh/year			2901.1206	(286)
Dwelling Primary energy Rate (DPER)			59.3600	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)		
Main dwelling							
Ground floor	3.0200	(1b)	x 2.8500	(2b)	= 8.6070	(1b) - (3b)	
First floor	45.8500	(1c)	x 2.5200	(2c)	= 115.5420	(1c) - (3c)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	48.8700					(4)	
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)		= 124.1490	(5)	

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1611	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4111	(18)

Number of sides sheltered 2 (19)

Shelter factor (20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.3494 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4455	0.4368	0.4281	0.3844	0.3756	0.3320	0.3320	0.3232	0.3494	0.3756	0.3931	0.4106	(22b)
Effective ac	0.5992	0.5954	0.5916	0.5739	0.5706	0.5551	0.5551	0.5522	0.5611	0.5706	0.5773	0.5843	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			2.1500	1.0000	2.1500			(26)
TER Opening Type			4.9100	1.1450	5.6221			(27)
GF			3.0200	0.1300	0.3926			(28a)
Exposed Floor			1.6100	0.1300	0.2093			(28b)
Main	54.9189	7.0600	47.8589	0.1800	8.6146			(29a)
PIJ	45.8500		45.8500	0.1100	5.0435			(30)
Flat	3.0200		3.0200	0.1100	0.3322			(30)
Total net area of external elements Aum(A, m2)			108.4189					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	22.3643			(33)
Main dwelling								
Party Wall 1			39.0200	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 73.9763 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	5.1100	0.0500	0.2555
E3 Sill	5.1100	0.0500	0.2555
E4 Jamb	13.8000	0.0500	0.6900
E5 Ground floor (normal)	2.0100	0.1600	0.3216
E7 Party floor between dwellings (in blocks of flats)	16.9400	0.0700	1.1858
E16 Corner (normal)	10.0800	0.0900	0.9072
E17 Corner (inverted - internal area greater than external area)	7.5600	-0.0900	-0.6804
P1 Party wall - Ground floor	5.1000	0.0800	0.4080
E18 Party wall between dwellings	11.4000	0.0600	0.6840
E25 Staggered party wall between dwellings	10.0800	0.0600	0.6048
E20 Exposed floor (normal)	1.2700	0.3200	0.4064
E21 Exposed floor (inverted)	3.8100	0.3200	1.2192
E6 Intermediate floor within a dwelling	2.5800	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	11.0600	0.0600	0.6636
E12 Gable (insulation at ceiling level)	8.4600	0.0600	0.5076
E14 Flat roof	2.0100	0.0800	0.1608
E24 Eaves (insulation at ceiling level - inverted)	2.0100	0.2400	0.4824
P4 Party wall - Roof (insulation at ceiling level)	9.8200	0.1200	1.1784
P5 Party wall - Roof (insulation at rafter level)	3.0000	0.0800	0.2400

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.4904 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 31.8547 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	24.5506	24.3928	24.2380	23.5111	23.3751	22.7419	22.7419	22.6247	22.9858	23.3751	23.6502	23.9378	(38)
Heat transfer coeff	56.4054	56.2475	56.0927	55.3658	55.2298	54.5967	54.5967	54.4794	54.8406	55.2298	55.5049	55.7926	(39)
Average = Sum(39)m / 12 =												55.3652	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1542	1.1510	1.1478	1.1329	1.1301	1.1172	1.1172	1.1148	1.1222	1.1301	1.1358	1.1417	(40)
HLP (average)												1.1329	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.6569 (42)
Hot water usage for mixer showers

52.0000	51.2186	50.0798	47.9010	46.2932	44.5001	43.4809	44.6110	45.8498	47.7751	50.0006	51.8008	(42a)

Hot water usage for baths

22.4849	22.1510	21.6808	20.8137	20.1645	19.4446	19.0557	19.5227	20.0311	20.8014	21.6863	22.4089	(42b)

Hot water usage for other uses

31.5982	30.4492	29.3001	28.1511	27.0021	25.8531	25.8531	27.0021	28.1511	29.3001	30.4492	31.5982	(42c)

Average daily hot water use (litres/day) 97.5150 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	106.0831	103.8187	101.0607	96.8659	93.4597	89.7977	88.3896	91.1358	94.0320	97.8766	102.1361	105.8079	(44)
Energy conte	168.0098	147.8365	155.3265	132.6045	125.8147	110.4167	106.8996	112.8451	115.9509	132.8176	145.5116	165.6696	(45)
Energy content (annual)										Total = Sum(45)m =		1619.7032	
Distribution loss (46)m = 0.15 x (45)m	25.2015	22.1755	23.2990	19.8907	18.8722	16.5625	16.0349	16.9268	17.3926	19.9226	21.8267	24.8504	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	214.6047	189.9222	201.9214	177.6964	172.4096	155.5086	153.4945	159.4400	161.0427	179.4125	190.6035	212.2645	(62)
WWHRS	-23.7722	-21.0244	-22.0155	-18.2297	-16.9894	-14.5380	-13.6270	-14.4910	-15.0415	-17.7323	-20.0886	-23.3320	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	190.8324	168.8978	179.9059	159.4667	155.4202	140.9706	139.8675	144.9490	146.0012	161.6802	170.5149	188.9325	(64)

											Total per year (kWh/year) = Sum(64)m =	1947.4390	(64)
12Total per year (kWh/year)												1947	(64)
Electric shower(s)													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
											Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	0.0000	(64a)
Heat gains from water heating, kWh/month													
93.1392	82.8242	88.9220	80.1645	79.1093	72.7870	72.8200	74.7969	74.6271	81.4378	84.4561	92.3611	(65)	

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	83.9607	92.9565	83.9607	86.7594	83.9607	86.7594	83.9607	83.9607	86.7594	83.9607	86.7594	83.9607	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	144.2994	145.7968	142.0235	133.9905	123.8503	114.3199	107.9530	106.4556	110.2290	118.2620	128.4022	137.9326	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	(71)
Water heating gains (Table 5)													
	125.1871	123.2503	119.5188	111.3395	106.3297	101.0931	97.8764	100.5335	103.6488	109.4594	117.3001	124.1412	(72)
Total internal gains													
	404.3005	412.8569	396.3563	382.9427	364.9940	350.0257	337.6434	338.8031	348.4905	362.5354	383.3150	396.8878	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	2.8600	10.6334	0.6300	0.7000	0.7700	9.2941	(74)
South	2.0500	46.7521	0.6300	0.7000	0.7700	29.2905	(78)

Solar gains	38.5846	65.7319	91.2869	117.5415	137.2730	139.1704	132.9415	117.5016	100.1197	72.8833	46.1847	33.0577	(83)
Total gains	442.8851	478.5888	487.6432	500.4842	502.2670	489.1961	470.5849	456.3047	448.6102	435.4187	429.4998	429.9455	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	17.8038	17.8537	17.9030	18.1381	18.1827	18.3936	18.3936	18.4332	18.3118	18.1827	18.0926	17.9993	
alpha	2.1869	2.1902	2.1935	2.2092	2.2122	2.2262	2.2262	2.2289	2.2208	2.2122	2.2062	2.2000	
util living area													
	0.8882	0.8658	0.8380	0.7815	0.6964	0.5686	0.4473	0.4731	0.6291	0.7775	0.8563	0.8938	(86)
MIT	18.2906	18.5708	18.9961	19.6109	20.1826	20.6426	20.8510	20.8257	20.5188	19.8236	18.9908	18.2546	(87)
Th 2	19.9568	19.9594	19.9620	19.9740	19.9763	19.9868	19.9868	19.9888	19.9828	19.9763	19.9717	19.9670	(88)
util rest of house													
	0.8761	0.8514	0.8196	0.7549	0.6557	0.5054	0.3616	0.3889	0.5707	0.7460	0.8387	0.8822	(89)
MIT 2	16.8256	17.1755	17.7079	18.4720	19.1596	19.6856	19.8920	19.8725	19.5556	18.7426	17.7133	16.7852	(90)
Living area fraction										fLA = Living area / (4) =		0.3912	(91)
MIT	17.3987	17.7214	18.2119	18.9176	19.5599	20.0600	20.2672	20.2454	19.9324	19.1655	18.2131	17.3601	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.3987	17.7214	18.2119	18.9176	19.5599	20.0600	20.2672	20.2454	19.9324	19.1655	18.2131	17.3601	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8374	0.8122	0.7817	0.7230	0.6372	0.5103	0.3865	0.4115	0.5675	0.7167	0.8010	0.8442	(94)
Useful gains	370.8562	388.7163	381.1770	361.8284	320.0366	249.6411	181.8907	187.7491	254.5936	312.0780	344.0265	362.9643	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	738.8399	721.1705	656.9509	554.6318	434.0988	298.0999	200.2163	209.4976	319.8540	473.0720	616.8316	734.2333	(97)
Space heating kWh													
	273.7799	223.4093	205.1758	138.8184	84.8623	0.0000	0.0000	0.0000	0.0000	119.7795	196.4197	276.2242	(98a)
Space heating requirement - total per year (kWh/year)												1518.4691	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	273.7799	223.4093	205.1758	138.8184	84.8623	0.0000	0.0000	0.0000	0.0000	119.7795	196.4197	276.2242	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1518.4691	
Space heating per m2											(98c) / (4) =	31.0716	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	273.7799	223.4093	205.1758	138.8184	84.8623	0.0000	0.0000	0.0000	0.0000	119.7795	196.4197	276.2242	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	296.6196	242.0469	222.2923	150.3992	91.9418	0.0000	0.0000	0.0000	0.0000	129.7720	212.8057	299.2678	(211)
Space heating efficiency (main heating system 2)													

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement												
	190.8324	168.8978	179.9059	159.4667	155.4202	140.9706	139.8675	144.9490	146.0012	161.6802	170.5149	188.9325 (64)
Efficiency of water heater												79.8000 (216)
(217)m	84.8686	84.6879	84.3553	83.7503	82.7625	79.8000	79.8000	79.8000	79.8000	83.3971	84.3778	84.9104 (217)
Fuel for water heating, kWh/month												
	224.8564	199.4355	213.2717	190.4072	187.7907	176.6549	175.2725	181.6404	182.9589	193.8680	202.0851	222.5081 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	17.4454	13.9953	12.6012	9.2322	7.1312	5.8263	6.5053	8.4559	10.9834	14.4108	16.2769	17.9302 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-23.3763	-33.2150	-48.1234	-54.5780	-59.2929	-55.5592	-54.9444	-51.7045	-45.9768	-38.2780	-25.8198	-20.1857 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-12.4013	-26.1875	-52.2162	-78.6423	-104.1612	-104.6692	-103.3673	-87.3742	-63.8973	-37.4382	-16.5592	-9.7931 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year	
Space heating fuel - main system 1	1645.1452 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	79.8000
Water heating fuel used	2350.7494 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
Total electricity for the above, kWh/year	86.0000 (231)
Electricity for lighting (calculated in Appendix L)	140.7942 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-1207.7611 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	3014.9278 (238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1645.1452	0.2100	345.4805	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2350.7494	0.2100	493.6574	(264)
Space and water heating			839.1379	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	140.7942	0.1443	20.3210	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-511.0540	0.1344	-68.6798	
PV Unit electricity exported	-696.7070	0.1258	-87.6666	
Total			-156.3465	(269)
Total CO2, kg/year			715.0416	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.6300	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1645.1452	1.1300	1859.0141	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2350.7494	1.1300	2656.3468	(278)
Space and water heating			4515.3609	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	140.7942	1.5338	215.9548	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-511.0540	1.4967	-764.8772	
PV Unit electricity exported	-696.7070	0.4619	-321.7956	
Total			-1086.6729	(283)
Total Primary energy kWh/year			3774.7437	(286)
Target Primary Energy Rate (TPER)			77.2400	(287)

Full SAP Calculation Printout

Property Reference	78449-22	**Issued on Date**	03/10/2025
Assessment Reference	001	**Prop Type Ref**	Top Flat / Mid
Property	6 Shepherd Street, MANCHESTER, M9 4QW		

SAP Rating	81 B	**DER**	5.67	**TER**	14.63
Environmental	96 A	**% DER < TER**			61.24
CO_2 Emissions (t/year)	0.26	**DFEE**	35.42	**TFEE**	38.12
Compliance Check	See BREL	**% DFEE < TFEE**			7.09
% DPER < TPER	23.14	**DPER**	59.36	**TPER**	77.24

Assessor Details	Mr. Daniel Goddard	**Assessor ID**	CP52-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	3.0200 (1b)	x	2.8500 (2b)	=	8.6070	(1b) - (3b)
First floor	45.8500 (1c)	x	2.5200 (2c)	=	115.5420	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	48.8700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	124.1490	(5)

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2. Ventilation rate

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				m3 per hour	
Number of open chimneys			0 * 80 =	0.0000	(6a)
Number of open flues			0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire			0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler			0 * 20 =	0.0000	(6d)
Number of flues attached to other heater			0 * 35 =	0.0000	(6e)
Number of blocked chimneys			0 * 20 =	0.0000	(6f)
Number of intermittent extract fans			0 * 10 =	0.0000	(7a)
Number of passive vents			0 * 10 =	0.0000	(7b)
Number of flueless gas fires			0 * 40 =	0.0000	(7c)
				Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =			0.0000 / (5) =	0.0000	(8)
Pressure test				Yes	
Pressure Test Method				Blower Door	
Measured/design AP50				2.6700	(17)
Infiltration rate				0.1335	(18)
Number of sides sheltered				2	(19)
Shelter factor			(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =	0.1135	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1447	0.1418	0.1390	0.1248	0.1220	0.1078	0.1078	0.1050	0.1135	0.1220	0.1277	0.1333	(22b)

Balanced mechanical ventilation with heat recovery		
If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	80.1000	(23c)

Effective ac	0.2442	0.2413	0.2385	0.2243	0.2215	0.2073	0.2073	0.2045	0.2130	0.2215	0.2272	0.2328	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door			2.1500	0.7800	1.6770			(26)
Window			4.9100	0.7282	3.5752			(27)
GF			3.0200	0.0900	0.2718	75.0000	226.5000	(28a)
Exposed Floor			1.6100	0.1400	0.2254	20.0000	32.2000	(28b)
Main	54.9189	7.0600	47.8589	0.1300	6.2217	9.0000	430.7301	(29a)
PIJ	45.8500		45.8500	0.1100	5.0435	9.0000	412.6500	(30)
Flat	3.0200		3.0200	0.1200	0.3624	9.0000	27.1800	(30)
Total net area of external elements Aum(A, m2)			108.4189					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		17.3770			(33)
Main dwelling								
Party Wall 1			39.0200	0.0000	0.0000	20.0000	780.4000	(32)
Party Floor 1			37.9700			30.0000	1139.1000	(32d)
Timber			50.4000			9.0000	453.6000	(32c)
Internal Floor 1			6.2700			18.0000	112.8600	(32d)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 3615.2201 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 73.9763 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	5.1100	0.1150	0.5877
E3 Sill	5.1100	0.0170	0.0869
E4 Jamb	13.8000	0.0940	1.2972
E5 Ground floor (normal)	2.0100	0.0670	0.1347
E7 Party floor between dwellings (in blocks of flats)	16.9400	0.0320	0.5421
E16 Corner (normal)	10.0800	0.0680	0.6854
E17 Corner (inverted - internal area greater than external area)	7.5600	-0.0290	-0.2192
P1 Party wall - Ground floor	5.1000	0.0560	0.2856
E18 Party wall between dwellings	11.4000	0.2400	2.7360
E25 Staggered party wall between dwellings	10.0800	0.0560	0.5645
E20 Exposed floor (normal)	1.2700	0.3200	0.4064
E21 Exposed floor (inverted)	3.8100	0.3200	1.2192
E6 Intermediate floor within a dwelling	2.5800	0.0320	0.0826
E10 Eaves (insulation at ceiling level)	11.0600	0.0420	0.4645
E12 Gable (insulation at ceiling level)	8.4600	0.0770	0.6514
E14 Flat roof	2.0100	0.2050	0.4120
E24 Eaves (insulation at ceiling level - inverted)	2.0100	0.1500	0.3015
P4 Party wall - Roof (insulation at ceiling level)	9.8200	0.1020	1.0016
P5 Party wall - Roof (insulation at rafter level)	3.0000	0.4800	1.4400

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 12.6800 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 30.0570 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	10.0039	9.8877	9.7714	9.1903	9.0741	8.4930	8.4930	8.3767	8.7254	9.0741	9.3065	9.5390	(38)
Heat transfer coeff	40.0609	39.9447	39.8285	39.2473	39.1311	38.5500	38.5500	38.4338	38.7824	39.1311	39.3636	39.5960	(39)

Average = Sum(39)m / 12 = 39.2183

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8197	0.8174	0.8150	0.8031	0.8007	0.7888	0.7888	0.7864	0.7936	0.8007	0.8055	0.8102	(40)
HLP (average)												0.8025	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.6569 (42)
Hot water usage for mixer showers

52.0000	51.2186	50.0798	47.9010	46.2932	44.5001	43.4809	44.6110	45.8498	47.7751	50.0006	51.8008	(42a)

Hot water usage for baths

22.4849	22.1510	21.6808	20.8137	20.1645	19.4446	19.0557	19.5227	20.0311	20.8014	21.6863	22.4089	(42b)

Hot water usage for other uses

31.5982	30.4492	29.3001	28.1511	27.0021	25.8531	25.8531	27.0021	28.1511	29.3001	30.4492	31.5982	(42c)

Average daily hot water use (litres/day) 97.5150 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	106.0831	103.8187	101.0607	96.8659	93.4597	89.7977	88.3896	91.1358	94.0320	97.8766	102.1361	105.8079	(44)
Energy conte	168.0098	147.8365	155.3265	132.6045	125.8147	110.4167	106.8996	112.8451	115.9509	132.8176	145.5116	165.6696	(45)
Energy content (annual)										Total = Sum(45)m =		1619.7032	
Distribution loss (46)m = 0.15 x (45)m	25.2015	22.1755	23.2990	19.8907	18.8722	16.5625	16.0349	16.9268	17.3926	19.9226	21.8267	24.8504	(46)
Water storage loss:													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8694	(55)
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	194.9612	172.1797	182.2779	158.6865	152.7661	136.4987	133.8510	139.7965	142.0329	159.7690	171.5936	192.6210	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	194.9612	172.1797	182.2779	158.6865	152.7661	136.4987	133.8510	139.7965	142.0329	159.7690	171.5936	192.6210	(64)
										Total per year (kWh/year) = Sum(64)m =		1937.0342	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	55.8632	49.1556	51.6461	44.0910	41.8334	36.7136	35.5441	37.5210	38.5537	44.1619	48.3826	55.0851	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	99.4132	99.4132	99.4132	99.4132	99.4132	99.4132	99.4132	99.4132	99.4132	99.4132	99.4132	99.4132	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	19.7425	17.5352	14.2605	10.7962	8.0702	6.8132	7.3620	9.5693	12.8440	16.3083	19.0342	20.2913	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	215.3723	217.6072	211.9753	199.9858	184.8511	170.6267	161.1239	158.8890	164.5209	176.5104	191.6451	205.8695	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	46.5982	46.5982	46.5982	46.5982	46.5982	46.5982	46.5982	46.5982	46.5982	46.5982	46.5982	46.5982	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	(71)
Water heating gains (Table 5)	75.0850	73.1483	69.4168	61.2375	56.2277	50.9911	47.7744	50.4314	53.5468	59.3573	67.1981	74.0392	(72)
Total internal gains	389.9358	388.0265	375.3886	351.7554	328.8850	308.1670	295.9962	298.6258	310.6475	331.9121	357.6133	379.9359	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	2.8600	10.6334	0.3000	0.0000	0.7700	7.0251	(74)
South	2.0500	46.7521	0.3000	0.0000	0.7700	22.1394	(78)

Solar gains	29.1645	49.6839	68.9999	88.8447	103.7589	105.1931	100.4849	88.8145	75.6763	55.0894	34.9091	24.9869	(83)
Total gains	419.1003	437.7105	444.3885	440.6001	432.6439	413.3600	396.4810	387.4402	386.3238	387.0015	392.5224	404.9228	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	25.0675	25.1405	25.2138	25.5872	25.6631	26.0500	26.0500	26.1288	25.8939	25.6631	25.5116	25.3618	
alpha	2.6712	2.6760	2.6809	2.7058	2.7109	2.7367	2.7367	2.7419	2.7263	2.7109	2.7008	2.6908	
util living area	0.8695	0.8493	0.8155	0.7569	0.6647	0.5283	0.4028	0.4258	0.5877	0.7486	0.8371	0.8775	(86)
MIT	19.2564	19.4451	19.7659	20.1842	20.5590	20.8353	20.9424	20.9313	20.7650	20.3228	19.7404	19.2182	(87)
Th 2	20.2363	20.2383	20.2404	20.2507	20.2527	20.2630	20.2630	20.2651	20.2589	20.2527	20.2486	20.2445	(88)
util rest of house	0.8581	0.8363	0.7991	0.7342	0.6314	0.4803	0.3423	0.3659	0.5419	0.7216	0.8213	0.8668	(89)
MIT 2	18.1887	18.4250	18.8258	19.3474	19.7969	20.1156	20.2220	20.2143	20.0395	19.5229	18.8052	18.1469	(90)
Living area fraction									fLA = Living area / (4) =			0.3912	(91)
MIT	18.6064	18.8241	19.1936	19.6748	20.0950	20.3972	20.5038	20.4949	20.3234	19.8359	19.1711	18.5660	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.6064	18.8241	19.1936	19.6748	20.0950	20.3972	20.5038	20.4949	20.3234	19.8359	19.1711	18.5660	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8295	0.8083	0.7734	0.7150	0.6239	0.4893	0.3625	0.3851	0.5461	0.7051	0.7952	0.8385	(94)
Useful gains	347.6347	353.8232	343.7076	315.0289	269.9454	202.2770	143.7214	149.1964	210.9716	272.8640	312.1379	339.5154	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	573.1295	556.1939	505.5683	422.8817	328.5077	223.4824	150.4926	157.3808	241.3574	361.4102	475.1611	568.8371	(97)
Space heating kWh	167.7681	135.9931	120.4244	77.6540	43.5704	0.0000	0.0000	0.0000	0.0000	65.8784	117.3767	170.6153	(98a)
Space heating requirement - total per year (kWh/year)												899.2804	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	167.7681	135.9931	120.4244	77.6540	43.5704	0.0000	0.0000	0.0000	0.0000	65.8784	117.3767	170.6153	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												899.2804	
Space heating per m2										(98c) / (4) =		18.4015	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Fraction of main heating from main system 2	0.0000 (203)
Fraction of total heating from main system 1	1.0000 (204)
Fraction of total heating from main system 2	0.0000 (205)
Efficiency of main space heating system 1 (in %)	100.0000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	167.7681	135.9931	120.4244	77.6540	43.5704	0.0000	0.0000	0.0000	0.0000	65.8784	117.3767	170.6153	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	167.7681	135.9931	120.4244	77.6540	43.5704	0.0000	0.0000	0.0000	0.0000	65.8784	117.3767	170.6153	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	194.9612	172.1797	182.2779	158.6865	152.7661	136.4987	133.8510	139.7965	142.0329	159.7690	171.5936	192.6210	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month	60.0768	53.0567	56.1685	48.8988	47.0745	42.0617	41.2458	43.0779	43.7671	49.2324	52.8761	59.3557	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	15.6682	14.1519	15.6682	15.1628	15.6682	15.1628	15.6682	15.6682	15.1628	15.6682	15.1628	15.6682	(231)
Lighting	17.2805	13.8631	12.4822	9.1450	7.0638	5.7712	6.4439	8.3760	10.8796	14.2746	16.1231	17.7608	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													

(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	899.2804	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	324.5200	
Water heating fuel used	596.8921	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.2180)		
mechanical ventilation fans (SFP = 1.2180)	184.4804	(230a)
Total electricity for the above, kWh/year	184.4804	(231)
Electricity for lighting (calculated in Appendix L)	139.4638	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	1820.1167	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	899.2804	16.4900	148.2913	(240)
Space heating - main system 2	0.0000	16.4900	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	596.8921	16.4900	98.4275	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	184.4804	16.4900	30.4208	(249)
Energy for lighting	139.4638	16.4900	22.9976	(250)
Additional standing charges			0.0000	(251)
Total energy cost			300.1372	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.1511	(257)
SAP value		81.3414	
SAP rating (Section 12)		81	(258)
SAP band		B	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	899.2804	0.1544	138.8795	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	596.8921	0.1411	84.2266	(264)
Space and water heating			223.1061	(265)
Pumps, fans and electric keep-hot	184.4804	0.1387	25.5897	(267)
Energy for lighting	139.4638	0.1443	20.1289	(268)
Total CO2, kg/year			268.8248	(272)
CO2 emissions per m2			5.5000	(273)
EI value			96.1625	
EI rating			96	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	3.0200	(1b) x	2.8500	(2b) =	8.6070	(1b) - (3b)
First floor	45.8500	(1c) x	2.5200	(2c) =	115.5420	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 48.8700						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		124.1490	(5)

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2. Ventilation rate

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	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)

Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		2.6700 (17)
Infiltration rate		0.1335 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1135 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.6000	4.5000	4.5000	4.1000	4.2000	3.7000	3.5000	3.5000	3.7000	4.1000	4.1000	4.2000	(22)
Wind factor	1.1500	1.1250	1.1250	1.0250	1.0500	0.9250	0.8750	0.8750	0.9250	1.0250	1.0250	1.0500	(22a)
Adj infilt rate	0.1305	0.1277	0.1277	0.1163	0.1191	0.1050	0.0993	0.0993	0.1050	0.1163	0.1163	0.1191	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	80.1000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2300	0.2272	0.2272	0.2158	0.2186	0.2045	0.1988	0.1988	0.2045	0.2158	0.2158	0.2186	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Door			2.1500	0.7800	1.6770			(26)
Window			4.9100	0.7282	3.5752			(27)
GF			3.0200	0.0900	0.2718	75.0000	226.5000	(28a)
Exposed Floor			1.6100	0.1400	0.2254	20.0000	32.2000	(28b)
Main	54.9189	7.0600	47.8589	0.1300	6.2217	9.0000	430.7301	(29a)
PIJ	45.8500		45.8500	0.1100	5.0435	9.0000	412.6500	(30)
Flat	3.0200		3.0200	0.1200	0.3624	9.0000	27.1800	(30)
Total net area of external elements Aum(A, m2)			108.4189					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		17.3770			(33)
Main dwelling								
Party Wall 1			39.0200	0.0000	0.0000	20.0000	780.4000	(32)
Party Floor 1			37.9700			30.0000	1139.1000	(32d)
Timber			50.4000			9.0000	453.6000	(32c)
Internal Floor 1			6.2700			18.0000	112.8600	(32d)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	3615.2201 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		73.9763 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	5.1100	0.1150	0.5877
E3 Sill	5.1100	0.0170	0.0869
E4 Jamb	13.8000	0.0940	1.2972
E5 Ground floor (normal)	2.0100	0.0670	0.1347
E7 Party floor between dwellings (in blocks of flats)	16.9400	0.0320	0.5421
E16 Corner (normal)	10.0800	0.0680	0.6854
E17 Corner (inverted - internal area greater than external area)	7.5600	-0.0290	-0.2192
P1 Party wall - Ground floor	5.1000	0.0560	0.2856
E18 Party wall between dwellings	11.4000	0.2400	2.7360
E25 Staggered party wall between dwellings	10.0800	0.0560	0.5645
E20 Exposed floor (normal)	1.2700	0.3200	0.4064
E21 Exposed floor (inverted)	3.8100	0.3200	1.2192
E6 Intermediate floor within a dwelling	2.5800	0.0320	0.0826
E10 Eaves (insulation at ceiling level)	11.0600	0.0420	0.4645
E12 Gable (insulation at ceiling level)	8.4600	0.0770	0.6514
E14 Flat roof	2.0100	0.2050	0.4120
E24 Eaves (insulation at ceiling level - inverted)	2.0100	0.1500	0.3015
P4 Party wall - Roof (insulation at ceiling level)	9.8200	0.1020	1.0016
P5 Party wall - Roof (insulation at rafter level)	3.0000	0.4800	1.4400

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		12.6800 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	30.0570 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	9.4228	9.3065	9.3065	8.8416	8.9579	8.3767	8.1443	8.1443	8.3767	8.8416	8.8416	8.9579	(38)
Heat transfer coeff	39.4798	39.3636	39.3636	38.8987	39.0149	38.4338	38.2013	38.2013	38.4338	38.8987	38.8987	39.0149	(39)
Average = Sum(39)m / 12 =												38.8502	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8079	0.8055	0.8055	0.7960	0.7983	0.7864	0.7817	0.7817	0.7864	0.7960	0.7960	0.7983	(40)
HLP (average)												0.7950	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		1.6569 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
52.0000	51.2186	50.0798	47.9010	46.2932	44.5001	43.4809	44.6110	45.8498	47.7751	50.0006	51.8008	(42a)

Hot water usage for baths

22.4849	22.1510	21.6808	20.8137	20.1645	19.4446	19.0557	19.5227	20.0311	20.8014	21.6863	22.4089	(42b)

Hot water usage for other uses

31.5982	30.4492	29.3001	28.1511	27.0021	25.8531	25.8531	27.0021	28.1511	29.3001	30.4492	31.5982	(42c)

Average daily hot water use (litres/day)	97.5150 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	106.0831	103.8187	101.0607	96.8659	93.4597	89.7977	88.3896	91.1358	94.0320	97.8766	102.1361	105.8079	(44)

Energy conte	168.0098	147.8365	155.3265	132.6045	125.8147	110.4167	106.8996	112.8451	115.9509	132.8176	145.5116	165.6696	(45)
Energy content (annual)										Total = Sum(45)m =		1619.7032	
Distribution loss (46)m = 0.15 x (45)m													
	25.2015	22.1755	23.2990	19.8907	18.8722	16.5625	16.0349	16.9268	17.3926	19.9226	21.8267	24.8504	(46)
Water storage loss:													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8694	(55)
Total storage loss													
	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage													
	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	194.9612	172.1797	182.2779	158.6865	152.7661	136.4987	133.8510	139.7965	142.0329	159.7690	171.5936	192.6210	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	194.9612	172.1797	182.2779	158.6865	152.7661	136.4987	133.8510	139.7965	142.0329	159.7690	171.5936	192.6210	(64)
										Total per year (kWh/year) = Sum(64)m =		1937.0342	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
					Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =							0.0000	(64a)
Heat gains from water heating, kWh/month													
	55.8632	49.1556	51.6461	44.0910	41.8334	36.7136	35.5441	37.5210	38.5537	44.1619	48.3826	55.0851	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	99.4132	99.4132	99.4132	99.4132	99.4132	99.4132	99.4132	99.4132	99.4132	99.4132	99.4132	99.4132	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	19.7425	17.5352	14.2605	10.7962	8.0702	6.8132	7.3620	9.5693	12.8440	16.3083	19.0342	20.2913	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	215.3723	217.6072	211.9753	199.9858	184.8511	170.6267	161.1239	158.8890	164.5209	176.5104	191.6451	205.8695	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	46.5982	46.5982	46.5982	46.5982	46.5982	46.5982	46.5982	46.5982	46.5982	46.5982	46.5982	46.5982	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	(71)
Water heating gains (Table 5)													
	75.0850	73.1483	69.4168	61.2375	56.2277	50.9911	47.7744	50.4314	53.5468	59.3573	67.1981	74.0392	(72)
Total internal gains													
	389.9358	388.0265	375.3886	351.7554	328.8850	308.1670	295.9962	298.6258	310.6475	331.9121	357.6133	379.9359	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	2.8600	8.9975	0.3000	0.0000	0.7700	5.9443	(74)
South	2.0500	39.5594	0.3000	0.0000	0.7700	18.7334	(78)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	24.6777	44.1635	64.6874	84.6986	96.7335	99.9334	93.5732	81.4604	71.7279	50.9160	30.6777	22.6072	(83)
Total gains	414.6134	432.1900	440.0760	436.4540	425.6186	408.1004	389.5694	380.0862	382.3755	382.8280	388.2910	402.5431	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	25.4365	25.5116	25.5116	25.8165	25.7396	26.1288	26.2878	26.2878	26.1288	25.8165	25.8165	25.7396	
alpha	2.6958	2.7008	2.7008	2.7211	2.7160	2.7419	2.7525	2.7525	2.7419	2.7211	2.7211	2.7160	
util living area													
	0.8646	0.8440	0.8123	0.7464	0.6439	0.5068	0.4061	0.4229	0.5890	0.7442	0.8302	0.8717	(86)
MIT	19.3592	19.5407	19.8161	20.2512	20.6219	20.8617	20.9425	20.9349	20.7676	20.3524	19.8261	19.3292	(87)
Th 2	20.2465	20.2486	20.2486	20.2568	20.2548	20.2651	20.2692	20.2692	20.2651	20.2568	20.2568	20.2548	(88)
util rest of house													
	0.8528	0.8305	0.7956	0.7225	0.6079	0.4565	0.3457	0.3621	0.5435	0.7165	0.8136	0.8605	(89)
MIT 2	18.3245	18.5516	18.8938	19.4333	19.8719	20.1452	20.2281	20.2217	20.0478	19.5619	18.9173	18.2930	(90)
Living area fraction									fLA = Living area / (4) =			0.3912	(91)
MIT	18.7293	18.9386	19.2546	19.7533	20.1653	20.4255	20.5076	20.5008	20.3294	19.8711	19.2728	18.6984	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.7293	18.9386	19.2546	19.7533	20.1653	20.4255	20.5076	20.5008	20.3294	19.8711	19.2728	18.6984	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8247	0.8033	0.7706	0.7049	0.6034	0.4678	0.3658	0.3819	0.5477	0.7008	0.7884	0.8327	(94)
Useful gains	341.9357	347.1848	339.1206	307.6466	256.8089	190.9181	142.5216	145.1384	209.4223	268.2869	306.1268	335.2011	(95)
Ext temp.	4.7000	5.3000	6.7000	9.3000	12.3000	15.0000	16.6000	16.5000	14.1000	10.8000	7.5000	4.6000	(96)
Heat loss rate W													
	553.8743	536.8637	494.1953	406.6186	306.8651	208.5229	149.2743	152.8340	239.4197	352.8555	457.9481	550.0492	(97)
Space heating kWh													
	157.6823	127.4642	115.3756	71.2599	37.2418	0.0000	0.0000	0.0000	0.0000	62.9190	109.3113	159.8469	(98a)
Space heating requirement - total per year (kWh/year)												841.1010	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	157.6823	127.4642	115.3756	71.2599	37.2418	0.0000	0.0000	0.0000	0.0000	62.9190	109.3113	159.8469	(98c)

Space heating requirement after solar contribution - total per year (kWh/year) 841.1010
Space heating per m2 (98c) / (4) = 17.2110 (99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (201)
Fraction of space heat from main system(s) 1.0000 (202)
Fraction of main heating from main system 2 0.0000 (203)
Fraction of total heating from main system 1 1.0000 (204)
Fraction of total heating from main system 2 0.0000 (205)
Efficiency of main space heating system 1 (in %) 100.0000 (206)
Efficiency of main space heating system 2 (in %) 0.0000 (207)
Efficiency of secondary/supplementary heating system, % 0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	157.6823	127.4642	115.3756	71.2599	37.2418	0.0000	0.0000	0.0000	0.0000	62.9190	109.3113	159.8469	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	157.6823	127.4642	115.3756	71.2599	37.2418	0.0000	0.0000	0.0000	0.0000	62.9190	109.3113	159.8469	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	194.9612	172.1797	182.2779	158.6865	152.7661	136.4987	133.8510	139.7965	142.0329	159.7690	171.5936	192.6210	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month	60.0768	53.0567	56.1685	48.8988	47.0745	42.0617	41.2458	43.0779	43.7671	49.2324	52.8761	59.3557	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	15.6682	14.1519	15.6682	15.1628	15.6682	15.1628	15.6682	15.6682	15.1628	15.6682	15.1628	15.6682	(231)
Lighting	17.2805	13.8631	12.4822	9.1450	7.0638	5.7712	6.4439	8.3760	10.8796	14.2746	16.1231	17.7608	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year
Space heating fuel - main system 1 841.1010 (211)
Space heating fuel - main system 2 0.0000 (213)
Space heating fuel - secondary 0.0000 (215)
Efficiency of water heater 324.5200
Water heating fuel used 596.8921 (219)
Space cooling fuel 0.0000 (221)

Electricity for pumps and fans:
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.2180)
mechanical ventilation fans (SFP = 1.2180) 184.4804 (230a)
Total electricity for the above, kWh/year 184.4804 (231)
Electricity for lighting (calculated in Appendix L) 139.4638 (232)

Energy saving/generation technologies (Appendices M ,N and Q)
PV generation 0.0000 (233)
Wind generation 0.0000 (234)
Hydro-electric generation (Appendix N) 0.0000 (235a)
Electricity generated - Micro CHP (Appendix N) 0.0000 (235)
Appendix Q - special features
Energy saved or generated -0.0000 (236)
Energy used 0.0000 (237)
Total delivered energy for all uses 1761.9374 (238)

10a. Fuel costs - using BEDF prices (583)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	841.1010	28.4300	239.1250	(240)
Space heating - main system 2	0.0000	28.4300	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	596.8921	28.4300	169.6964	(247)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(247a)
Pumps, fans and electric keep-hot	184.4804	28.4300	52.4478	(249)
Energy for lighting	139.4638	28.4300	39.6496	(250)
Additional standing charges			0.0000	(251)
Total energy cost			500.9188	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	841.1010	0.1545	129.9731	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	596.8921	0.1411	84.2266	(264)

Space and water heating			214.1997 (265)
Pumps, fans and electric keep-hot	184.4804	0.1387	25.5897 (267)
Energy for lighting	139.4638	0.1443	20.1289 (268)
Total CO2, kg/year			259.9183 (272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	841.1010	1.5721	1322.3043	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	596.8921	1.5218	908.3378	(278)
Space and water heating			2230.6421	(279)
Pumps, fans and electric keep-hot	184.4804	1.5128	279.0820	(281)
Energy for lighting	139.4638	1.5338	213.9142	(282)
Total Primary energy kWh/year			2723.6383	(286)

SAP 10 EPC IMPROVEMENTS

001

Current energy efficiency rating: B 81
Current environmental impact rating: A 96

N	Solar water heating		Not applicable
U	Solar photovoltaic panels		Not applicable
V2	Wind turbine		Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
(none)			

	Typical annual savings	Energy efficiency	Environmental impact
Recommended measures			
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: B 81
Potential environmental impact rating: A 96

Fuel prices for cost data on this page from database revision number 583 TEST (01 Oct 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, West Pennines (England)):

	Current	Potential	Saving
Electricity	£501	£501	£0
Space heating	£292	£292	£0
Water heating	£170	£170	£0
Lighting	£40	£40	£0
Total cost of fuels	£501	£501	£0
Total cost of uses	£502	£502	£0
Delivered energy	36 kWh/m²	36 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.3 tonnes	0.3 tonnes	0.0 tonnes
CO2 emissions per m²	5 kg/m²	5 kg/m²	0 kg/m²
Primary energy	56 kWh/m²	56 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	3.0200 (1b)	x	2.8500 (2b)	=	8.6070	(1b) - (3b)
First floor	45.8500 (1c)	x	2.5200 (2c)	=	115.5420	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	48.8700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	124.1490	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.6700	(17)
Infiltration rate		0.1335	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1135	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1447	0.1418	0.1390	0.1248	0.1220	0.1078	0.1078	0.1050	0.1135	0.1220	0.1277	0.1333	(22b)

Balanced mechanical ventilation with heat recovery		
If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	80.1000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2442	0.2413	0.2385	0.2243	0.2215	0.2073	0.2073	0.2045	0.2130	0.2215	0.2272	0.2328	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Door			2.1500	0.7800	1.6770			(26)
Window			4.9100	0.7282	3.5752			(27)
GF			3.0200	0.0900	0.2718	75.0000	226.5000	(28a)
Exposed Floor			1.6100	0.1400	0.2254	20.0000	32.2000	(28b)
Main	54.9189	7.0600	47.8589	0.1300	6.2217	9.0000	430.7301	(29a)
PIJ	45.8500		45.8500	0.1100	5.0435	9.0000	412.6500	(30)
Flat	3.0200		3.0200	0.1200	0.3624	9.0000	27.1800	(30)
Total net area of external elements Aum(A, m2)			108.4189					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		17.3770			(33)
Main dwelling								
Party Wall 1			39.0200	0.0000	0.0000	20.0000	780.4000	(32)
Party Floor 1			37.9700			30.0000	1139.1000	(32d)
Timber			50.4000			9.0000	453.6000	(32c)
Internal Floor 1			6.2700			18.0000	112.8600	(32d)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	3615.2201 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		73.9763 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	5.1100	0.1150	0.5877
E3 Sill	5.1100	0.0170	0.0869
E4 Jamb	13.8000	0.0940	1.2972
E5 Ground floor (normal)	2.0100	0.0670	0.1347
E7 Party floor between dwellings (in blocks of flats)	16.9400	0.0320	0.5421
E16 Corner (normal)	10.0800	0.0680	0.6854
E17 Corner (inverted - internal area greater than external area)	7.5600	-0.0290	-0.2192
P1 Party wall - Ground floor	5.1000	0.0560	0.2856
E18 Party wall between dwellings	11.4000	0.2400	2.7360
E25 Staggered party wall between dwellings	10.0800	0.0560	0.5645
E20 Exposed floor (normal)	1.2700	0.3200	0.4064
E21 Exposed floor (inverted)	3.8100	0.3200	1.2192
E6 Intermediate floor within a dwelling	2.5800	0.0320	0.0826
E10 Eaves (insulation at ceiling level)	11.0600	0.0420	0.4645
E12 Gable (insulation at ceiling level)	8.4600	0.0770	0.6514
E14 Flat roof	2.0100	0.2050	0.4120
E24 Eaves (insulation at ceiling level - inverted)	2.0100	0.1500	0.3015
P4 Party wall - Roof (insulation at ceiling level)	9.8200	0.1020	1.0016
P5 Party wall - Roof (insulation at rafter level)	3.0000	0.4800	1.4400

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	12.6800	(36)
Point Thermal bridges	(36a) = 0.0000	
Total fabric heat loss	(33) + (36) + (36a) = 30.0570	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	10.0039	9.8877	9.7714	9.1903	9.0741	8.4930	8.4930	8.3767	8.7254	9.0741	9.3065	9.5390	(38)
Heat transfer coeff	40.0609	39.9447	39.8285	39.2473	39.1311	38.5500	38.5500	38.4338	38.7824	39.1311	39.3636	39.5960	(39)
Average = Sum(39)m / 12 =												39.2183	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8197	0.8174	0.8150	0.8031	0.8007	0.7888	0.7888	0.7864	0.7936	0.8007	0.8055	0.8102	(40)
HLP (average)												0.8025	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.6569	(42)

Hot water usage for mixer showers

52.0000	51.2186	50.0798	47.9010	46.2932	44.5001	43.4809	44.6110	45.8498	47.7751	50.0006	51.8008	(42a)

Hot water usage for baths

22.4849	22.1510	21.6808	20.8137	20.1645	19.4446	19.0557	19.5227	20.0311	20.8014	21.6863	22.4089	(42b)

Hot water usage for other uses

31.5982	30.4492	29.3001	28.1511	27.0021	25.8531	25.8531	27.0021	28.1511	29.3001	30.4492	31.5982	(42c)

Average daily hot water use (litres/day)	97.5150 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	106.0831	103.8187	101.0607	96.8659	93.4597	89.7977	88.3896	91.1358	94.0320	97.8766	102.1361	105.8079	(44)
Energy conte	168.0098	147.8365	155.3265	132.6045	125.8147	110.4167	106.8996	112.8451	115.9509	132.8176	145.5116	165.6696	(45)
Energy content (annual)										Total = Sum(45)m =		1619.7032	
Distribution loss (46)m = 0.15 x (45)m	25.2015	22.1755	23.2990	19.8907	18.8722	16.5625	16.0349	16.9268	17.3926	19.9226	21.8267	24.8504	(46)

Water storage loss:		
Store volume	200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):	1.6100	(48)

Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8694	(55)
Total storage loss													
	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage													
	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	194.9612	172.1797	182.2779	158.6865	152.7661	136.4987	133.8510	139.7965	142.0329	159.7690	171.5936	192.6210	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	194.9612	172.1797	182.2779	158.6865	152.7661	136.4987	133.8510	139.7965	142.0329	159.7690	171.5936	192.6210	(64)
									Total per year (kWh/year) = Sum(64)m =			1937.0342	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Heat gains from water heating, kWh/month													
	55.8632	49.1556	51.6461	44.0910	41.8334	36.7136	35.5441	37.5210	38.5537	44.1619	48.3826	55.0851	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	99.4132	99.4132	99.4132	99.4132	99.4132	99.4132	99.4132	99.4132	99.4132	99.4132	99.4132	99.4132	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	19.7425	17.5352	14.2605	10.7962	8.0702	6.8132	7.3620	9.5693	12.8440	16.3083	19.0342	20.2913	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	215.3723	217.6072	211.9753	199.9858	184.8511	170.6267	161.1239	158.8890	164.5209	176.5104	191.6451	205.8695	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	46.5982	46.5982	46.5982	46.5982	46.5982	46.5982	46.5982	46.5982	46.5982	46.5982	46.5982	46.5982	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	(71)
Water heating gains (Table 5)													
	75.0850	73.1483	69.4168	61.2375	56.2277	50.9911	47.7744	50.4314	53.5468	59.3573	67.1981	74.0392	(72)
Total internal gains													
	389.9358	388.0265	375.3886	351.7554	328.8850	308.1670	295.9962	298.6258	310.6475	331.9121	357.6133	379.9359	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	2.8600	10.6334	0.3000	0.0000	0.7700	7.0251	(74)
South	2.0500	46.7521	0.3000	0.0000	0.7700	22.1394	(78)

Solar gains	29.1645	49.6839	68.9999	88.8447	103.7589	105.1931	100.4849	88.8145	75.6763	55.0894	34.9091	24.9869	(83)
Total gains	419.1003	437.7105	444.3885	440.6001	432.6439	413.3600	396.4810	387.4402	386.3238	387.0015	392.5224	404.9228	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	25.0675	25.1405	25.2138	25.5872	25.6631	26.0500	26.0500	26.1288	25.8939	25.6631	25.5116	25.3618	
alpha	2.6712	2.6760	2.6809	2.7058	2.7109	2.7367	2.7367	2.7419	2.7263	2.7109	2.7008	2.6908	
util living area													
	0.8695	0.8493	0.8155	0.7569	0.6647	0.5283	0.4028	0.4258	0.5877	0.7486	0.8371	0.8775	(86)
MIT	19.2564	19.4451	19.7659	20.1842	20.5590	20.8353	20.9424	20.9313	20.7650	20.3228	19.7404	19.2182	(87)
Th 2	20.2363	20.2383	20.2404	20.2507	20.2527	20.2630	20.2630	20.2651	20.2589	20.2527	20.2486	20.2445	(88)
util rest of house													
	0.8581	0.8363	0.7991	0.7342	0.6314	0.4803	0.3423	0.3659	0.5419	0.7216	0.8213	0.8668	(89)
MIT 2	18.1887	18.4250	18.8258	19.3474	19.7969	20.1156	20.2220	20.2143	20.0395	19.5229	18.8052	18.1469	(90)
Living area fraction										fLA = Living area / (4) =		0.3912	(91)
MIT	18.6064	18.8241	19.1936	19.6748	20.0950	20.3972	20.5038	20.4949	20.3234	19.8359	19.1711	18.5660	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.6064	18.8241	19.1936	19.6748	20.0950	20.3972	20.5038	20.4949	20.3234	19.8359	19.1711	18.5660	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8295	0.8083	0.7734	0.7150	0.6239	0.4893	0.3625	0.3851	0.5461	0.7051	0.7952	0.8385	(94)
Useful gains	347.6347	353.8232	343.7076	315.0289	269.9454	202.2770	143.7214	149.1964	210.9716	272.8640	312.1379	339.5154	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	573.1295	556.1939	505.5683	422.8817	328.5077	223.4824	150.4926	157.3808	241.3574	361.4102	475.1611	568.8371	(97)
Space heating kWh													
	167.7681	135.9931	120.4244	77.6540	43.5704	0.0000	0.0000	0.0000	0.0000	65.8784	117.3767	170.6153	(98a)
Space heating requirement - total per year (kWh/year)												899.2804	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	167.7681	135.9931	120.4244	77.6540	43.5704	0.0000	0.0000	0.0000	0.0000	65.8784	117.3767	170.6153	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												899.2804	
Space heating per m2											(98c) / (4) =	18.4015	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Fraction of main heating from main system 2												0.0000	(203)
Fraction of total heating from main system 1												1.0000	(204)
Fraction of total heating from main system 2												0.0000	(205)
Efficiency of main space heating system 1 (in %)												100.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	167.7681	135.9931	120.4244	77.6540	43.5704	0.0000	0.0000	0.0000	0.0000	65.8784	117.3767	170.6153	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	167.7681	135.9931	120.4244	77.6540	43.5704	0.0000	0.0000	0.0000	0.0000	65.8784	117.3767	170.6153	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement													
	194.9612	172.1797	182.2779	158.6865	152.7661	136.4987	133.8510	139.7965	142.0329	159.7690	171.5936	192.6210	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month													
	60.0768	53.0567	56.1685	48.8988	47.0745	42.0617	41.2458	43.0779	43.7671	49.2324	52.8761	59.3557	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	15.6682	14.1519	15.6682	15.1628	15.6682	15.1628	15.6682	15.6682	15.1628	15.6682	15.1628	15.6682	(231)
Lighting	17.2805	13.8631	12.4822	9.1450	7.0638	5.7712	6.4439	8.3760	10.8796	14.2746	16.1231	17.7608	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												899.2804	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												324.5200	
Water heating fuel used												596.8921	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.2180)													
mechanical ventilation fans (SFP = 1.2180)												184.4804	(230a)
Total electricity for the above, kWh/year												184.4804	(231)
Electricity for lighting (calculated in Appendix L)												139.4638	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												1820.1167	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	899.2804	16.4900	148.2913	(240)
Space heating - main system 2	0.0000	16.4900	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	596.8921	16.4900	98.4275	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	184.4804	16.4900	30.4208	(249)
Energy for lighting	139.4638	16.4900	22.9976	(250)
Additional standing charges			0.0000	(251)
Total energy cost			300.1372	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.1511	(257)
SAP value		81.3414	
SAP rating (Section 12)		81	(258)
SAP band		B	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	

Space heating - main system 1	899.2804	0.1544	138.8795	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	596.8921	0.1411	84.2266	(264)
Space and water heating			223.1061	(265)
Pumps, fans and electric keep-hot	184.4804	0.1387	25.5897	(267)
Energy for lighting	139.4638	0.1443	20.1289	(268)
Total CO2, kg/year			268.8248	(272)
CO2 emissions per m2			5.5000	(273)
EI value			96.1625	
EI rating			96	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	3.0200	(1b) x	2.8500	(2b) =	8.6070	(1b) - (3b)
First floor	45.8500	(1c) x	2.5200	(2c) =	115.5420	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	48.8700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		124.1490	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		2.6700 (17)
Infiltration rate		0.1335 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1135 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.6000	4.5000	4.5000	4.1000	4.2000	3.7000	3.5000	3.5000	3.7000	4.1000	4.1000	4.2000	(22)
Wind factor	1.1500	1.1250	1.1250	1.0250	1.0500	0.9250	0.8750	0.8750	0.9250	1.0250	1.0250	1.0500	(22a)
Adj infilt rate	0.1305	0.1277	0.1277	0.1163	0.1191	0.1050	0.0993	0.0993	0.1050	0.1163	0.1163	0.1191	(22b)
Balanced mechanical ventilation with heat recovery													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												80.1000	(23c)
Effective ac	0.2300	0.2272	0.2272	0.2158	0.2186	0.2045	0.1988	0.1988	0.2045	0.2158	0.2158	0.2186	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door			2.1500	0.7800	1.6770			(26)
Window			4.9100	0.7282	3.5752			(27)
GF			3.0200	0.0900	0.2718	75.0000	226.5000	(28a)
Exposed Floor			1.6100	0.1400	0.2254	20.0000	32.2000	(28b)
Main	54.9189	7.0600	47.8589	0.1300	6.2217	9.0000	430.7301	(29a)
PIJ	45.8500		45.8500	0.1100	5.0435	9.0000	412.6500	(30)
Flat	3.0200		3.0200	0.1200	0.3624	9.0000	27.1800	(30)
Total net area of external elements Aum(A, m2)			108.4189					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		17.3770			(33)
Main dwelling								
Party Wall 1			39.0200	0.0000	0.0000	20.0000	780.4000	(32)
Party Floor 1			37.9700			30.0000	1139.1000	(32d)
Timber			50.4000			9.0000	453.6000	(32c)
Internal Floor 1			6.2700			18.0000	112.8600	(32d)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	3615.2201 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		73.9763 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	5.1100	0.1150	0.5877
E3 Sill	5.1100	0.0170	0.0869
E4 Jamb	13.8000	0.0940	1.2972
E5 Ground floor (normal)	2.0100	0.0670	0.1347
E7 Party floor between dwellings (in blocks of flats)	16.9400	0.0320	0.5421
E16 Corner (normal)	10.0800	0.0680	0.6854

E17 Corner (inverted - internal area greater than external area)	7.5600	-0.0290	-0.2192
P1 Party wall - Ground floor	5.1000	0.0560	0.2856
E18 Party wall between dwellings	11.4000	0.2400	2.7360
E25 Staggered party wall between dwellings	10.0800	0.0560	0.5645
E20 Exposed floor (normal)	1.2700	0.3200	0.4064
E21 Exposed floor (inverted)	3.8100	0.3200	1.2192
E6 Intermediate floor within a dwelling	2.5800	0.0320	0.0826
E10 Eaves (insulation at ceiling level)	11.0600	0.0420	0.4645
E12 Gable (insulation at ceiling level)	8.4600	0.0770	0.6514
E14 Flat roof	2.0100	0.2050	0.4120
E24 Eaves (insulation at ceiling level - inverted)	2.0100	0.1500	0.3015
P4 Party wall - Roof (insulation at ceiling level)	9.8200	0.1020	1.0016
P5 Party wall - Roof (insulation at rafter level)	3.0000	0.4800	1.4400

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 12.6800 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 30.0570 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	9.4228	9.3065	9.3065	8.8416	8.9579	8.3767	8.1443	8.1443	8.3767	8.8416	8.8416	8.9579	(38)
Heat transfer coeff	39.4798	39.3636	39.3636	38.8987	39.0149	38.4338	38.2013	38.2013	38.4338	38.8987	38.8987	39.0149	(39)

Average = Sum(39)m / 12 = 38.8502

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8079	0.8055	0.8055	0.7960	0.7983	0.7864	0.7817	0.7817	0.7864	0.7960	0.7960	0.7983	(40)
HLP (average)												0.7950	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.6569 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	52.0000	51.2186	50.0798	47.9010	46.2932	44.5001	43.4809	44.6110	45.8498	47.7751	50.0006	51.8008	(42a)
Hot water usage for baths	22.4849	22.1510	21.6808	20.8137	20.1645	19.4446	19.0557	19.5227	20.0311	20.8014	21.6863	22.4089	(42b)
Hot water usage for other uses	31.5982	30.4492	29.3001	28.1511	27.0021	25.8531	25.8531	27.0021	28.1511	29.3001	30.4492	31.5982	(42c)
Average daily hot water use (litres/day)												97.5150	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	106.0831	103.8187	101.0607	96.8659	93.4597	89.7977	88.3896	91.1358	94.0320	97.8766	102.1361	105.8079	(44)
Energy conte	168.0098	147.8365	155.3265	132.6045	125.8147	110.4167	106.8996	112.8451	115.9509	132.8176	145.5116	165.6696	(45)
Energy content (annual)										Total = Sum(45)m =		1619.7032	
Distribution loss (46)m = 0.15 x (45)m	25.2015	22.1755	23.2990	19.8907	18.8722	16.5625	16.0349	16.9268	17.3926	19.9226	21.8267	24.8504	(46)
Water storage loss:													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8694	(55)
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	194.9612	172.1797	182.2779	158.6865	152.7661	136.4987	133.8510	139.7965	142.0329	159.7690	171.5936	192.6210	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	194.9612	172.1797	182.2779	158.6865	152.7661	136.4987	133.8510	139.7965	142.0329	159.7690	171.5936	192.6210	(64)
										Total per year (kWh/year) = Sum(64)m =		1937.0342	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	55.8632	49.1556	51.6461	44.0910	41.8334	36.7136	35.5441	37.5210	38.5537	44.1619	48.3826	55.0851	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	99.4132	99.4132	99.4132	99.4132	99.4132	99.4132	99.4132	99.4132	99.4132	99.4132	99.4132	99.4132	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	19.7425	17.5352	14.2605	10.7962	8.0702	6.8132	7.3620	9.5693	12.8440	16.3083	19.0342	20.2913	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	215.3723	217.6072	211.9753	199.9858	184.8511	170.6267	161.1239	158.8890	164.5209	176.5104	191.6451	205.8695	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	46.5982	46.5982	46.5982	46.5982	46.5982	46.5982	46.5982	46.5982	46.5982	46.5982	46.5982	46.5982	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	(71)
Water heating gains (Table 5)	75.0850	73.1483	69.4168	61.2375	56.2277	50.9911	47.7744	50.4314	53.5468	59.3573	67.1981	74.0392	(72)
Total internal gains	389.9358	388.0265	375.3886	351.7554	328.8850	308.1670	295.9962	298.6258	310.6475	331.9121	357.6133	379.9359	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	2.8600	8.9975	0.3000	0.0000	0.7700	5.9443	(74)
South	2.0500	39.5594	0.3000	0.0000	0.7700	18.7334	(78)

Solar gains	24.6777	44.1635	64.6874	84.6986	96.7335	99.9334	93.5732	81.4604	71.7279	50.9160	30.6777	22.6072	(83)
Total gains	414.6134	432.1900	440.0760	436.4540	425.6186	408.1004	389.5694	380.0862	382.3755	382.8280	388.2910	402.5431	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	25.4365	25.5116	25.5116	25.8165	25.7396	26.1288	26.2878	26.2878	26.1288	25.8165	25.8165	25.7396	
alpha	2.6958	2.7008	2.7008	2.7211	2.7160	2.7419	2.7525	2.7525	2.7419	2.7211	2.7211	2.7160	
util living area	0.8646	0.8440	0.8123	0.7464	0.6439	0.5068	0.4061	0.4229	0.5890	0.7442	0.8302	0.8717	(86)
MIT	19.3592	19.5407	19.8161	20.2512	20.6219	20.8617	20.9425	20.9349	20.7676	20.3524	19.8261	19.3292	(87)
Th 2	20.2465	20.2486	20.2486	20.2568	20.2548	20.2651	20.2692	20.2692	20.2651	20.2568	20.2568	20.2548	(88)
util rest of house	0.8528	0.8305	0.7956	0.7225	0.6079	0.4565	0.3457	0.3621	0.5435	0.7165	0.8136	0.8605	(89)
MIT 2	18.3245	18.5516	18.8938	19.4333	19.8719	20.1452	20.2281	20.2217	20.0478	19.5619	18.9173	18.2930	(90)
Living area fraction									fLA = Living area / (4) =			0.3912	(91)
MIT	18.7293	18.9386	19.2546	19.7533	20.1653	20.4255	20.5076	20.5008	20.3294	19.8711	19.2728	18.6984	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.7293	18.9386	19.2546	19.7533	20.1653	20.4255	20.5076	20.5008	20.3294	19.8711	19.2728	18.6984	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8247	0.8033	0.7706	0.7049	0.6034	0.4678	0.3658	0.3819	0.5477	0.7008	0.7884	0.8327	(94)
Useful gains	341.9357	347.1848	339.1206	307.6466	256.8089	190.9181	142.5216	145.1384	209.4223	268.2869	306.1268	335.2011	(95)
Ext temp.	4.7000	5.3000	6.7000	9.3000	12.3000	15.0000	16.6000	16.5000	14.1000	10.8000	7.5000	4.6000	(96)
Heat loss rate W	553.8743	536.8637	494.1953	406.6186	306.8651	208.5229	149.2743	152.8340	239.4197	352.8555	457.9481	550.0492	(97)
Space heating kWh	157.6823	127.4642	115.3756	71.2599	37.2418	0.0000	0.0000	0.0000	0.0000	62.9190	109.3113	159.8469	(98a)
Space heating requirement - total per year (kWh/year)												841.1010	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	157.6823	127.4642	115.3756	71.2599	37.2418	0.0000	0.0000	0.0000	0.0000	62.9190	109.3113	159.8469	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												841.1010	
Space heating per m2											(98c) / (4) =	17.2110	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Fraction of main heating from main system 2	0.0000 (203)
Fraction of total heating from main system 1	1.0000 (204)
Fraction of total heating from main system 2	0.0000 (205)
Efficiency of main space heating system 1 (in %)	100.0000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	157.6823	127.4642	115.3756	71.2599	37.2418	0.0000	0.0000	0.0000	0.0000	62.9190	109.3113	159.8469	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	157.6823	127.4642	115.3756	71.2599	37.2418	0.0000	0.0000	0.0000	0.0000	62.9190	109.3113	159.8469	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	194.9612	172.1797	182.2779	158.6865	152.7661	136.4987	133.8510	139.7965	142.0329	159.7690	171.5936	192.6210	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month	60.0768	53.0567	56.1685	48.8988	47.0745	42.0617	41.2458	43.0779	43.7671	49.2324	52.8761	59.3557	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	15.6682	14.1519	15.6682	15.1628	15.6682	15.1628	15.6682	15.6682	15.1628	15.6682	15.1628	15.6682	(231)
Lighting	17.2805	13.8631	12.4822	9.1450	7.0638	5.7712	6.4439	8.3760	10.8796	14.2746	16.1231	17.7608	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												841.1010	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												324.5200	
Water heating fuel used												596.8921	(219)

Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.2180)		
mechanical ventilation fans (SFP = 1.2180)	184.4804	(230a)
Total electricity for the above, kWh/year	184.4804	(231)
Electricity for lighting (calculated in Appendix L)	139.4638	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	1761.9374	(238)

10a. Fuel costs - using BEDF prices (583)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	841.1010	28.4300	239.1250	(240)
Space heating - main system 2	0.0000	28.4300	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	596.8921	28.4300	169.6964	(247)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(247a)
Pumps, fans and electric keep-hot	184.4804	28.4300	52.4478	(249)
Energy for lighting	139.4638	28.4300	39.6496	(250)
Additional standing charges			0.0000	(251)
Total energy cost			500.9188	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	841.1010	0.1545	129.9731	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	596.8921	0.1411	84.2266	(264)
Space and water heating			214.1997	(265)
Pumps, fans and electric keep-hot	184.4804	0.1387	25.5897	(267)
Energy for lighting	139.4638	0.1443	20.1289	(268)
Total CO2, kg/year			259.9183	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	841.1010	1.5721	1322.3043	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	596.8921	1.5218	908.3378	(278)
Space and water heating			2230.6421	(279)
Pumps, fans and electric keep-hot	184.4804	1.5128	279.0820	(281)
Energy for lighting	139.4638	1.5338	213.9142	(282)
Total Primary energy kWh/year			2723.6383	(286)

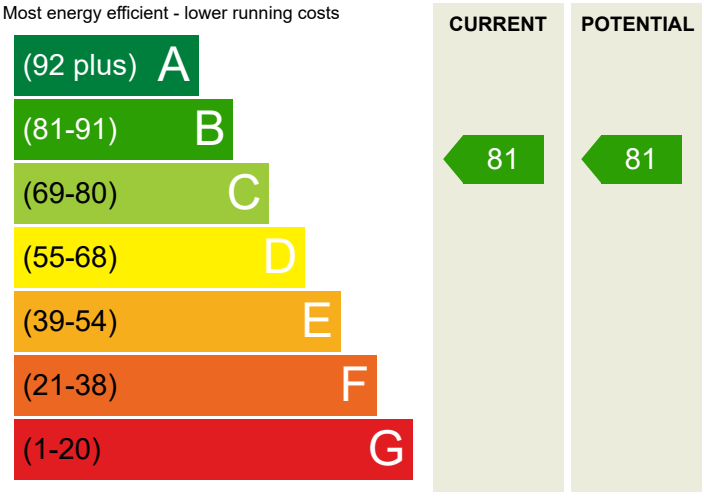
Energy Report

Dwelling Address	6 Shepherd Street, MANCHESTER, M9 4QW
Reference	78449-22-001
Assessment Date	02/07/2025
Submission Date	18/08/2025
Property Type	Flat, Mid-Terrace
Total Floor Area	49

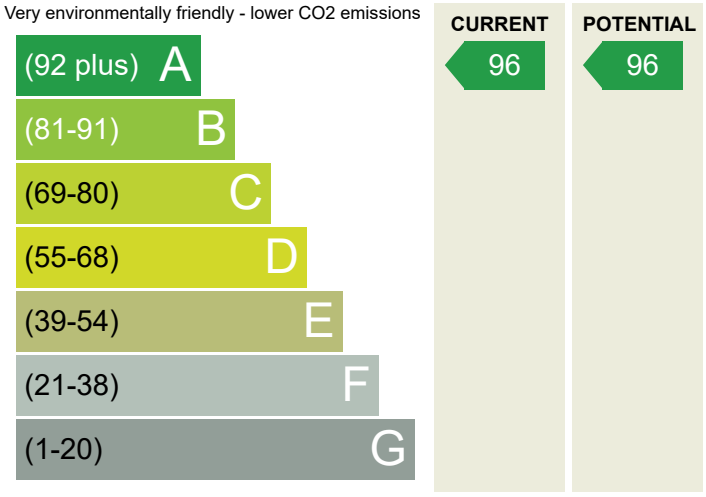
This Energy Report has been generated using the UK's National Calculation Methodology for dwellings, Standard Assessment Procedure (SAP). This methodology is used to assess the energy efficiency of dwellings which is calculated based on a dwelling's heating, hot water, ventilation and lighting usage.

This document is not an Energy Performance Certificate (EPC) as required by the Energy Performance of Buildings Regulations

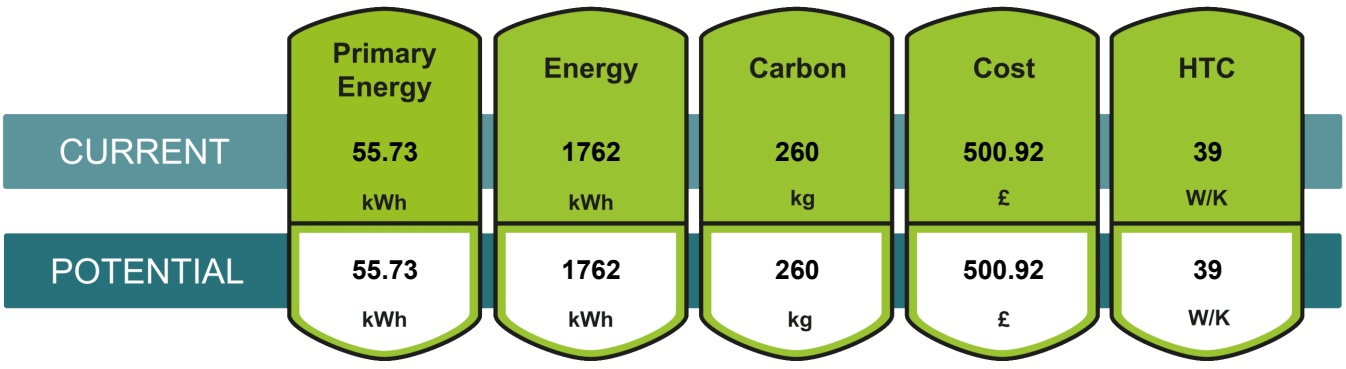
Energy Efficiency Rating



Carbon Dioxide (CO2) Emissions Rating



Additional ratings for your home



Energy Report

Breakdown of property's energy performance

Each feature is assessed as one of the following:

Very Poor | Poor | Average | Good | Very Good

Feature	Description	Energy Performance
Walls	Average thermal transmittance 0.13 W/m²K	Very Good
Roof	Average thermal transmittance 0.11 W/m²K	Very Good
Floor	Average thermal transmittance 0.11 W/m²K	Very Good
Windows	High performance glazing	Very Good
Main heating	Room heaters, electric	Very Poor
Main heating controls	Programmer and room thermostat	Good
Secondary heating	None	
Hot water	From main system	Very Good
Lighting	Good lighting efficiency	Good
Air tightness	Air permeability [AP50] = 2.7 m³/h.m² (as tested)	Very Good

Recommendations

The recommended measures provided below will help to improve the energy efficiency of the dwelling.
To reach the dwelling's potential energy rating all of the recommended measures shown below would need to be installed.
Having these measures installed individually or in any other order may give a different result when compared with the cumulative potential rating.

Recommended measures	Cumulative savings (per year)	Cumulative rating	Typical costs	Incremental savings (per year)	Cumulative CO2 rating

The typical cost is based on average installation prices across the country so may not be representative of the actual costs in your area.

Estimated energy costs of the dwelling

Energy Report

The table below shows the estimated running costs of the space and water heating and lighting within the dwelling. It does not include the energy used from household appliances. The estimated annual costs after potential improvements indicates the total energy cost if all recommended measures named above were installed.

	Estimated annual costs	Estimated annual costs after potential improvements	Potential future savings
Lighting	£40	£40	
Heating	£292	£292	
Hot Water	£170	£170	
New Technologies e.g. Impact of PV	£0	£0	
TOTAL	£501	£501	

Estimated energy use and potential savings

Space Heating
841
kWh per year

Water Heating
597
kWh per year

About this document

Created by:	
Company/Trading name:	
Phone number:	
Email address:	

Disclaimer

This Energy Report should not under any circumstances be treated as a Condition Survey and cannot be used to indicate that any element of the dwelling (e.g.heating system) is working correctly.
This Energy Report must not be used in situations where an Energy Performance Certificate (EPC) is required.
This Energy Report is generated from a set of data inputs which may not reflect the actual dimensions, services or construction of the dwelling.
The calculation used to generate this report reflects the SAP Methodology current at the time of report generation.

Glossary terms for additional metrics

Primary Energy	The measure of the energy required for lighting, heating and hot water in a property. This includes the efficiency of the property's heating system, power station efficiency for electricity and the energy used to produce the fuel and deliver it to the property.
Energy Used	The estimated amount of fuel energy for lighting, heating and hot water for the property. The estimate is based on typical usage which is likely to be different to actual consumption.
Carbon (CO2)	The current emissions based on the energy estimates.
Cost	The estimated cost of energy. The cost of each unit of fuel is based on an industry standard which is likely to be different to those the occupier actually pays.
Heat Transfer Coefficient	Heat flow through the property envelope where internal and external temperatures are different.

Building Regulations England Part L (BREL) Compliance Report

Approved Document L1 2021 Edition, England assessed by Array SAP 10 program, Array

Date: Fri 03 Oct 2025 15:03:31

Project Information			
Assessed By	Paul Goddard	Building Type	Flat, End-terrace
OCDEA Registration	EES/005113	Assessment Date	2025-10-03

Dwelling Details			
Assessment Type	As built	Total Floor Area	38 m^2
Site Reference	78449-23	Plot Reference	001
Address	4 Shepherd Street, MANCHESTER, M9 4QW		

Client Details	
Name	-
Company	John Southworth
Address	Unit 10, Charles Street, DUKINFIELD, SK16 4SD

This report covers items included within the SAP calculations. It is not a complete report of regulations compliance.

1a Target emission rate and dwelling emission rate		
Fuel for main heating system	Electricity	
Target carbon dioxide emission rate	*15.88 $kgCO_2/m^2$*	
Dwelling carbon dioxide emission rate	4.57 $kgCO_2/m^2$	OK
1b Target primary energy rate and dwelling primary energy		
Target primary energy	*84.09 kWh_{PE}/m^2*	
Dwelling primary energy	48.17 kWh_{PE}/m^2	OK
1c Target fabric energy efficiency and dwelling fabric energy efficiency		
Target fabric energy efficiency	*35.7 kWh/m^2*	
Dwelling fabric energy efficiency	26.2 kWh/m^2	OK

2a Fabric U-values				
Element	***Maximum permitted average U-Value [W/m^2K]***	**Dwelling average U-Value [W/m^2K]**	**Element with highest individual U-Value**	
External walls	*0.26*	0.13	Walls (1) (0.13)	OK
Party walls	*0.2*	0	Party Wall (1) (0)	**N/A**
Curtain walls	*1.6*	0	N/A	**N/A**
Floors	*0.18*	0.09	GF (0.09)	OK
Roofs	*0.16*	N/A	N/A	**N/A**
Windows, doors, and roof windows	*1.6*	0.76	Front (0.78)	OK
Rooflights	*2.2*	N/A	N/A	**N/A**

2b Envelope elements (better than typically expected values are flagged with a subsequent (!))		
Name	**Net area [m^2]**	**U-Value [W/m^2K]**
Exposed wall: Walls (1)	32.19	0.13 **(!)**
Party wall: Party Wall (1)	27.22	0 **(!)**
Ground floor: GF, GF	37.97	0.09 **(!)**

2c Openings (better than typically expected values are flagged with a subsequent (!))				
Name	**Area [m^2]**	**Orientation**	**Frame factor**	**U-Value [W/m^2K]**
Front, Door	2.15	South	N/A	0.78 **(!)**
Front, Window	2.81	South	1.0	0.75 **(!)**
Rear, Window	1.66	North	1.0	0.75 **(!)**

2d Thermal bridging (better than typically expected values are flagged with a subsequent (!))				
Building part **1**: Thermal bridging calculated from linear thermal transmittances for each junction				
Main element	**Junction detail**	**Source**	**Psi value [W/mK]**	**Drawing / reference**
External wall	E2: Other lintels (including other steel lintels)	Calculated by person with suitable expertise	0.115	Thermal Bridge Report
External wall	E3: Sill	Calculated by person with suitable expertise	0.017 **(!)**	Thermal Bridge Report
External wall	E4: Jamb	Calculated by person with suitable expertise	0.094	Thermal Bridge Report

Main element	Junction detail	Source	Psi value [W/mK]	Drawing / reference
External wall	E5: Ground floor (normal)	Calculated by person with suitable expertise	0.067	Thermal Bridge Report
External wall	E7: Party floor between dwellings (in blocks of flats)	Calculated by person with suitable expertise	0.032 **(!)**	Thermal Bridge Report
External wall	E16: Corner (normal)	Calculated by person with suitable expertise	0.068	Thermal Bridge Report
External wall	E17: Corner (inverted - internal area greater than external area)	Calculated by person with suitable expertise	-0.029 **(!)**	Thermal Bridge Report
Party wall	P1: Ground floor	Calculated by person with suitable expertise	0.056	Thermal Bridge Report
External wall	E18: Party wall between dwellings	SAP table default	0.24	Thermal Bridge Report
External wall	E25: Staggered party wall between dwellings	Calculated by person with suitable expertise	0.056	Thermal Bridge Report

3 Air permeability (better than typically expected values are flagged with a subsequent (!))		
Maximum permitted air permeability at 50Pa	*8 m^3/hm^2*	
Dwelling air permeability at 50Pa	3.6 m^3/hm^2, Measured value **(!)**	OK
Air permeability test certificate reference		

4 Space heating	
Main heating system 1: Room heaters - Electricity	
Efficiency	100.0%
Emitter type	
Flow temperature	
System type	Panel, convector or radiant heaters
Manufacturer	
Model	
Commissioning	
Main heating system 2: Heat pump with radiators or underfloor heating - Electricity	
Efficiency	0.0%
Emitter type	
Flow temperature	
System type	
Manufacturer	Vaillant Group UK Ltd
Model	aroSTOR 200ltr
Commissioning	
Secondary heating system: N/A	
Fuel	N/A
Efficiency	N/A
Commissioning	

5 Hot water	
Cylinder/store - type: N/A	
Capacity	N/A
Declared heat loss	N/A
Primary pipework insulated	N/A
Manufacturer	
Model	
Commissioning	
Waste water heat recovery system 1 - type: N/A	
Efficiency	
Manufacturer	
Model	

6 Controls	
Main heating 1 - type: Programmer and room thermostats	
Function	
Ecodesign class	
Manufacturer	
Model	

Main heating 2 - type: Not applicable		
Function		
Ecodesign class		
Manufacturer		
Model		
Water heating - type: Cylinder thermostat and HW separately timed		
Manufacturer		
Model		

7 Lighting		
Minimum permitted light source efficacy	*75 lm/W*	
Lowest light source efficacy	75 lm/W	**OK**
External lights control	N/A	

8 Mechanical ventilation		
System type: Balanced whole-house mechanical ventilation with heat recovery		
Maximum permitted specific fan power	*1.5 W/(l/s)*	
Specific fan power	0.87 W/(l/s)	**OK**
Minimum permitted heat recovery efficiency	*73%*	
Heat recovery efficiency	89%	**OK**
Manufacturer/Model	DV96 Adroit	
Commissioning		

9 Local generation
N/A

10 Heat networks
N/A

11 Supporting documentary evidence	
Documentary evidence identified in 11.1 and 11.2 is needed to confirm the data values used for any calculations undertaken, manufacturer declarations made, and tests performed as reflected in this "As built" BREL Compliance Report are correct. 11.1 SAP Conventions, Appendix 1 (documentary evidence) schedules the minimum documentary evidence required. 11.2 Indicative photographic evidence of key stages during construction (guidance within Approved Document L, Volume 1 – Appendix B) that confirms the products identified in this BREL Compliance Report are used in this dwelling, and workmanship is of sufficient quality to support the calculated values claimed in 2a to 2d.	

12 Declarations	
a. Assessor Declaration	
This declaration by the assessor is confirmation that the contents of this BREL Compliance Report are a true and accurate reflection based upon the design and construction information submitted for this dwelling for the purpose of carrying out the assessment, and that the supporting documentary evidence (identified in 11.1 and 11.2) pursuant to Part L of the Building Regulations 2010 (as amended) has been reviewed in the course of preparing this BREL Compliance Report.	
Signed: Name:	Assessor ID: Date:
b. Client Declaration	
This declaration by the client is confirmation that the dwelling has been constructed and completed according to the specifications set out in this BREL Compliance Report, and that photographic evidence of key stages, as described in 11.2, has been provided to the Assessor for this dwelling.	
Signed: Name:	Organisation: Date:

Full SAP Calculation Printout

Property Reference	78449-23	**Issued on Date**	03/10/2025
Assessment Reference	001	**Prop Type Ref**	GF Flat / End
Property	4 Shepherd Street, MANCHESTER, M9 4QW		

SAP Rating	87 B	**DER**	4.57	**TER**	15.88
Environmental	97 A	**% DER < TER**			71.22
CO_2 Emissions (t/year)	0.16	**DFEE**	26.20	**TFEE**	35.74
Compliance Check	See BREL	**% DFEE < TFEE**			26.70
% DPER < TPER	42.72	**DPER**	48.17	**TPER**	84.09

Assessor Details	Mr. Daniel Goddard	**Assessor ID**	CP52-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	37.9700	(1b)	x 2.3600	(2b) =	89.6092	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	37.9700					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	89.6092	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.6000	(17)
Infiltration rate		0.1800	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1530	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1951	0.1913	0.1874	0.1683	0.1645	0.1453	0.1453	0.1415	0.1530	0.1645	0.1721	0.1798	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	80.1000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2946	0.2907	0.2869	0.2678	0.2640	0.2448	0.2448	0.2410	0.2525	0.2640	0.2716	0.2793	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door			2.1500	0.7800	1.6770			(26)
Window			4.4700	0.7282	3.2549			(27)
GF			37.9700	0.0900	3.4173	75.0000	2847.7500	(28a)
Main	38.8100	6.6200	32.1900	0.1300	4.1847	9.0000	289.7100	(29a)
Total net area of external elements Aum(A, m2)			76.7800					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	12.5339			(33)
Main dwelling								
Party Wall 1			27.2200	0.0000	0.0000	20.0000	544.4000	(32)
Party Ceiling			37.9700			20.0000	759.4000	(32b)
Timber			50.4000			9.0000	453.6000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	4894.8600 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		128.9139 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total

E2 Other lintels (including other steel lintels)	5.1000	0.1150	0.5865	
E3 Sill	5.1000	0.0170	0.0867	
E4 Jamb	10.8000	0.0940	1.0152	
E5 Ground floor (normal)	15.4000	0.0670	1.0318	
E7 Party floor between dwellings (in blocks of flats)	15.4000	0.0320	0.4928	
E16 Corner (normal)	12.6000	0.0680	0.8568	
E17 Corner (inverted - internal area greater than external area)	2.5200	-0.0290	-0.0731	
P1 Party wall - Ground floor	10.8000	0.0560	0.6048	
E18 Party wall between dwellings	2.5200	0.2400	0.6048	
E25 Staggered party wall between dwellings	5.0400	0.0560	0.2822	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				5.4886 (36)
Point Thermal bridges			(36a) =	0.0000
Total fabric heat loss			(33) + (36) + (36a) =	18.0224 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	8.7109	8.5978	8.4847	7.9191	7.8060	7.2405	7.2405	7.1274	7.4667	7.8060	8.0322	8.2585	(38)
Heat transfer coeff	26.7333	26.6202	26.5071	25.9415	25.8284	25.2629	25.2629	25.1498	25.4891	25.8284	26.0546	26.2809	(39)
Average = Sum(39)m / 12 =												25.9133	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7041	0.7011	0.6981	0.6832	0.6802	0.6653	0.6653	0.6624	0.6713	0.6802	0.6862	0.6921	(40)
HLP (average)												0.6825	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.3535 (42)
Hot water usage for mixer showers	46.9130	46.2079	45.1806	43.2150	41.7644	40.1467	39.2272	40.2468	41.3644	43.1013	45.1092	46.7332 (42a)
Hot water usage for baths	20.2973	19.9959	19.5714	18.7887	18.2026	17.5528	17.2017	17.6233	18.0822	18.7776	19.5764	20.2287 (42b)
Hot water usage for other uses	28.4911	27.4550	26.4190	25.3830	24.3469	23.3109	23.3109	24.3469	25.3830	26.4190	27.4550	28.4911 (42c)
Average daily hot water use (litres/day)												87.9720 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	95.7014	93.6589	91.1710	87.3866	84.3139	81.0104	79.7399	82.2170	84.8296	88.2979	92.1406	95.4530	(44)
Energy conte	151.5676	133.3690	140.1264	119.6279	113.5028	99.6117	96.4385	101.8018	104.6034	119.8195	131.2712	149.4563	(45)
Energy content (annual)											Total = Sum(45)m =	1461.1961	
Distribution loss (46)m = 0.15 x (45)m	22.7351	20.0053	21.0190	17.9442	17.0254	14.9418	14.4658	15.2703	15.6905	17.9729	19.6907	22.4185	(46)
Water storage loss:													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8694	(55)
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	178.5190	157.7122	167.0778	145.7099	140.4542	125.6937	123.3899	128.7532	130.6854	146.7709	157.3532	176.4077	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	178.5190	157.7122	167.0778	145.7099	140.4542	125.6937	123.3899	128.7532	130.6854	146.7709	157.3532	176.4077	(64)
										Total per year (kWh/year) = Sum(64)m =		1778.5271	(64)
12Total per year (kWh/year)												1779	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	50.3962	44.3452	46.5920	39.7763	37.7397	33.1209	32.0658	33.8491	34.7806	39.8400	43.6477	49.6942	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	67.4075	74.6297	67.4075	69.6544	67.4075	69.6544	67.4075	67.4075	69.6544	67.4075	69.6544	67.4075	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	116.4640	117.6725	114.6270	108.1436	99.9594	92.2675	87.1288	85.9203	88.9657	95.4491	103.6333	111.3253	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	(71)
Water heating gains (Table 5)	67.7369	65.9899	62.6237	55.2449	50.7254	46.0012	43.0992	45.4961	48.3064	53.5483	60.6218	66.7933	(72)
Total internal gains	294.9106	301.5944	287.9606	276.3452	261.3946	251.2255	240.9378	242.1262	250.2289	259.7073	277.2118	288.8284	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	1.6600	10.6334	0.3000	0.0000	0.7700	4.0775	(74)
South	2.8100	46.7521	0.3000	0.0000	0.7700	30.3472	(78)

Solar gains	34.4247	57.4932	76.5512	92.8227	103.2145	102.4289	98.7471	90.8067	82.0549	62.8828	41.0019	29.6220	(83)

Total gains	329.3353	359.0876	364.5117	369.1679	364.6091	353.6543	339.6849	332.9329	332.2838	322.5901	318.2137	318.4504	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	50.8610	51.0771	51.2951	52.4134	52.6429	53.8214	53.8214	54.0634	53.3437	52.6429	52.1858	51.7366	
alpha	4.3907	4.4051	4.4197	4.4942	4.5095	4.5881	4.5881	4.6042	4.5562	4.5095	4.4791	4.4491	
util living area													
	0.9144	0.8792	0.8364	0.7461	0.6208	0.4502	0.3259	0.3457	0.5152	0.7367	0.8661	0.9217	(86)
MIT	20.2346	20.4047	20.5805	20.7960	20.9263	20.9869	20.9976	20.9969	20.9750	20.8355	20.5412	20.2170	(87)
Th 2	20.3372	20.3399	20.3425	20.3557	20.3583	20.3716	20.3716	20.3742	20.3663	20.3583	20.3530	20.3478	(88)
util rest of house													
	0.9040	0.8655	0.8182	0.7200	0.5853	0.4081	0.2799	0.2994	0.4717	0.7058	0.8492	0.9120	(89)
MIT 2	19.4516	19.6617	19.8772	20.1419	20.2886	20.3614	20.3702	20.3723	20.3458	20.1922	19.8425	19.4386	(90)
Living area fraction										fLA = Living area / (4) =		0.4772	(91)
MIT	19.8253	20.0163	20.2128	20.4541	20.5929	20.6599	20.6696	20.6704	20.6460	20.4992	20.1759	19.8101	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8253	20.0163	20.2128	20.4541	20.5929	20.6599	20.6696	20.6704	20.6460	20.4992	20.1759	19.8101	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8950	0.8582	0.8143	0.7241	0.5985	0.4276	0.3018	0.3214	0.4911	0.7128	0.8442	0.9031	(94)
Useful gains	294.7694	308.1703	296.8354	267.3117	218.2127	151.2102	102.5117	107.0005	163.1723	229.9382	268.6467	287.6024	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	415.0416	402.3978	363.4868	299.7308	229.6904	153.0909	102.8099	107.3989	166.8526	255.6807	340.6889	410.2469	(97)
Space heating kWh													
	89.4825	63.3209	49.5886	23.3418	8.5394	0.0000	0.0000	0.0000	0.0000	19.1524	51.8704	91.2475	(98a)
Space heating requirement - total per year (kWh/year)												396.5434	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	89.4825	63.3209	49.5886	23.3418	8.5394	0.0000	0.0000	0.0000	0.0000	19.1524	51.8704	91.2475	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												396.5434	
Space heating per m2											(98c) / (4) =	10.4436	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Fraction of main heating from main system 2												0.0000	(203)
Fraction of total heating from main system 1												1.0000	(204)
Fraction of total heating from main system 2												0.0000	(205)
Efficiency of main space heating system 1 (in %)												100.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	89.4825	63.3209	49.5886	23.3418	8.5394	0.0000	0.0000	0.0000	0.0000	19.1524	51.8704	91.2475	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	89.4825	63.3209	49.5886	23.3418	8.5394	0.0000	0.0000	0.0000	0.0000	19.1524	51.8704	91.2475	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement													
	178.5190	157.7122	167.0778	145.7099	140.4542	125.6937	123.3899	128.7532	130.6854	146.7709	157.3532	176.4077	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month													
	55.0102	48.5986	51.4846	44.9001	43.2806	38.7322	38.0223	39.6750	40.2704	45.2271	48.4880	54.3596	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	11.3091	10.2147	11.3091	10.9443	11.3091	10.9443	11.3091	11.3091	10.9443	11.3091	10.9443	11.3091	(231)
Lighting	13.5004	10.8306	9.7517	7.1445	5.5186	4.5088	5.0343	6.5438	8.4997	11.1521	12.5962	13.8757	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												396.5434	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												324.5200	
Water heating fuel used												548.0485	(219)
Space cooling fuel												0.0000	(221)

Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.2180)		
mechanical ventilation fans (SFP = 1.2180)	133.1557	(230a)
Total electricity for the above, kWh/year	133.1557	(231)
Electricity for lighting (calculated in Appendix L)	108.9563	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	1186.7040	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	396.5434	0.1566	62.0796	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	548.0485	0.1411	77.3114	(264)
Space and water heating			139.3910	(265)
Pumps, fans and electric keep-hot	133.1557	0.1387	18.4703	(267)
Energy for lighting	108.9563	0.1443	15.7258	(268)
Total CO2, kg/year			173.5871	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.5700	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	396.5434	1.5796	626.3673	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	548.0485	1.5216	833.9227	(278)
Space and water heating			1460.2900	(279)
Pumps, fans and electric keep-hot	133.1557	1.5128	201.4379	(281)
Energy for lighting	108.9563	1.5338	167.1209	(282)
Total Primary energy kWh/year			1828.8488	(286)
Dwelling Primary energy Rate (DPER)			48.1700	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		37.9700	(1b)	x 2.3600	(2b) =	89.6092	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	37.9700						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		89.6092	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.2232	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4732	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.4022	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.5128	0.5028	0.4927	0.4424	0.4324	0.3821	0.3821	0.3720	0.4022	0.4324	0.4525	0.4726	(22b)
Effective ac	0.6315	0.6264	0.6214	0.5979	0.5935	0.5730	0.5730	0.5692	0.5809	0.5935	0.6024	0.6117	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			2.1500	1.0000	2.1500			(26)
TER Opening Type			4.4700	1.1450	5.1183			(27)
GF			37.9700	0.1300	4.9361			(28a)
Main	38.8100	6.6200	32.1900	0.1800	5.7942			(29a)
Total net area of external elements Aum(A, m2)			76.7800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		17.9986			(33)
Main dwelling								
Party Wall 1			27.2200	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 138.9139 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	5.1000	0.0500	0.2550
E3 Sill	5.1000	0.0500	0.2550
E4 Jamb	10.8000	0.0500	0.5400
E5 Ground floor (normal)	15.4000	0.1600	2.4640
E7 Party floor between dwellings (in blocks of flats)	15.4000	0.0700	1.0780
E16 Corner (normal)	12.6000	0.0900	1.1340
E17 Corner (inverted - internal area greater than external area)	2.5200	-0.0900	-0.2268
P1 Party wall - Ground floor	10.8000	0.0800	0.8640
E18 Party wall between dwellings	2.5200	0.0600	0.1512
E25 Staggered party wall between dwellings	5.0400	0.0600	0.3024

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.8168 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 24.8154 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	18.6739	18.5229	18.3749	17.6798	17.5497	16.9442	16.9442	16.8321	17.1774	17.5497	17.8128	18.0879	(38)
Heat transfer coeff	43.4893	43.3383	43.1903	42.4952	42.3651	41.7597	41.7597	41.6475	41.9929	42.3651	42.6282	42.9033	(39)

Average = Sum(39)m / 12 = 42.4945

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1454	1.1414	1.1375	1.1192	1.1158	1.0998	1.0998	1.0969	1.1059	1.1158	1.1227	1.1299	(40)
HLP (average)												1.1192	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.3535 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	46.9130	46.2079	45.1806	43.2150	41.7644	40.1467	39.2272	40.2468	41.3644	43.1013	45.1092	46.7332	(42a)
Hot water usage for baths	20.2973	19.9959	19.5714	18.7887	18.2026	17.5528	17.2017	17.6233	18.0822	18.7776	19.5764	20.2287	(42b)
Hot water usage for other uses	28.4911	27.4550	26.4190	25.3830	24.3469	23.3109	23.3109	24.3469	25.3830	26.4190	27.4550	28.4911	(42c)

Average daily hot water use (litres/day) 87.9720 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	95.7014	93.6589	91.1710	87.3866	84.3139	81.0104	79.7399	82.2170	84.8296	88.2979	92.1406	95.4530	(44)
Energy conte	151.5676	133.3690	140.1264	119.6279	113.5028	99.6117	96.4385	101.8018	104.6034	119.8195	131.2712	149.4563	(45)
Energy content (annual)										Total = Sum(45)m =		1461.1961	
Distribution loss (46)m = 0.15 x (45)m	22.7351	20.0053	21.0190	17.9442	17.0254	14.9418	14.4658	15.2703	15.6905	17.9729	19.6907	22.4185	(46)

Water storage loss:
Store volume 150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.3938 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.7527 (55)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	198.1625	175.4547	186.7213	164.7198	160.0977	144.7035	143.0334	148.3967	149.6953	166.4144	176.3631	196.0513	(62)
WWHRS	-21.4466	-18.9676	-19.8618	-16.4463	-15.3274	-13.1158	-12.2939	-13.0734	-13.5701	-15.9976	-18.1233	-21.0495	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	176.7158	156.4871	166.8596	148.2735	144.7703	131.5878	130.7394	135.3234	136.1252	150.4168	158.2397	175.0018	(64)
									Total per year (kWh/year) = Sum(64)m =			1810.5403	(64)
12Total per year (kWh/year)												1811	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	87.6721	78.0138	83.8680	75.8498	75.0156	69.1944	69.3417	71.1250	70.8541	77.1159	79.7212	86.9702	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	65.4789	72.4945	65.4789	67.6615	65.4789	67.6615	65.4789	65.4789	67.6615	65.4789	67.6615	65.4789	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	116.4640	117.6725	114.6270	108.1436	99.9594	92.2675	87.1288	85.9203	88.9657	95.4491	103.6333	111.3253	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	(71)
Water heating gains (Table 5)	117.8389	116.0919	112.7258	105.3469	100.8274	96.1033	93.2012	95.5981	98.4085	103.6504	110.7238	116.8954	(72)

Total internal gains	346.0841	352.5612	339.1340	327.4544	312.5681	299.3346	289.1112	290.2996	298.3381	310.8808	328.3210	340.0019	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	1.6600	10.6334	0.6300	0.7000	0.7700	5.3945	(74)
South	2.8100	46.7521	0.6300	0.7000	0.7700	40.1494	(78)

Solar gains	45.5439	76.0635	101.2772	122.8044	136.5527	135.5134	130.6424	120.1373	108.5587	83.1940	54.2455	39.1899	(83)
Total gains	391.6280	428.6248	440.4112	450.2588	449.1208	434.8480	419.7537	410.4369	406.8967	394.0747	382.5665	379.1918	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	33.6900	33.8074	33.9232	34.4782	34.5840	35.0854	35.0854	35.1799	34.8906	34.5840	34.3706	34.1502	
alpha	3.2460	3.2538	3.2615	3.2985	3.3056	3.3390	3.3390	3.3453	3.3260	3.3056	3.2914	3.2767	
util living area													
	0.9331	0.9096	0.8788	0.8155	0.7152	0.5616	0.4217	0.4466	0.6260	0.8086	0.9009	0.9383	(86)
MIT	19.4276	19.6570	19.9553	20.3546	20.6802	20.8982	20.9703	20.9634	20.8456	20.4642	19.9129	19.4026	(87)
Th 2	19.9640	19.9672	19.9703	19.9852	19.9880	20.0010	20.0010	20.0034	19.9960	19.9880	19.9824	19.9765	(88)
util rest of house													
	0.9221	0.8952	0.8589	0.7844	0.6661	0.4891	0.3323	0.3575	0.5568	0.7713	0.8829	0.9281	(89)
MIT 2	18.1741	18.4597	18.8299	19.3211	19.6950	19.9281	19.9866	19.9845	19.8771	19.4592	18.7927	18.1516	(90)
Living area fraction										fLA = Living area / (4) =		0.4772	(91)
MIT	18.7723	19.0311	19.3669	19.8143	20.1651	20.3910	20.4560	20.4517	20.3393	19.9388	19.3273	18.7486	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.7723	19.0311	19.3669	19.8143	20.1651	20.3910	20.4560	20.4517	20.3393	19.9388	19.3273	18.7486	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9066	0.8796	0.8455	0.7786	0.6753	0.5184	0.3738	0.3985	0.5816	0.7693	0.8692	0.9130	(94)
Useful gains	355.0307	377.0359	372.3463	350.5740	303.2715	225.4122	156.9122	163.5524	236.6520	303.1467	332.5204	346.2076	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	629.3890	612.4174	555.7277	463.8067	358.6268	241.8317	161.0259	168.7415	262.0066	395.6381	521.2271	624.1838	(97)
Space heating kWh													
	204.1226	158.1763	136.4358	81.5275	41.1844	0.0000	0.0000	0.0000	0.0000	68.8136	135.8688	206.8142	(98a)
Space heating requirement - total per year (kWh/year)												1032.9432	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	204.1226	158.1763	136.4358	81.5275	41.1844	0.0000	0.0000	0.0000	0.0000	68.8136	135.8688	206.8142	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1032.9432	
Space heating per m2											(98c) / (4) =	27.2042	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	204.1226	158.1763	136.4358	81.5275	41.1844	0.0000	0.0000	0.0000	0.0000	68.8136	135.8688	206.8142	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	221.1512	171.3720	147.8177	88.3288	44.6201	0.0000	0.0000	0.0000	0.0000	74.5543	147.2035	224.0674	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	176.7158	156.4871	166.8596	148.2735	144.7703	131.5878	130.7394	135.3234	136.1252	150.4168	158.2397	175.0018	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.3839	84.0839	83.6121	82.7764	81.6324	79.8000	79.8000	79.8000	79.8000	82.4221	83.7199	84.4353	(217)
Fuel for water heating, kWh/month													
	209.4188	186.1084	199.5640	179.1253	177.3442	164.8970	163.8339	169.5781	170.5829	182.4957	189.0110	207.2613	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	13.6052	10.9146	9.8274	7.2000	5.5615	4.5438	5.0734	6.5945	8.5657	11.2386	12.6940	13.9834	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-18.3889	-26.2500	-38.2205	-43.5891	-47.5889	-44.7066	-44.2359	-41.5216	-36.7467	-30.3811	-20.3628	-15.8670	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-9.4088	-19.9034	-39.7394	-59.9177	-79.4083	-79.7844	-78.7658	-66.5369	-48.6209	-28.4473	-12.5639	-7.4254	(233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1119.1150	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2199.2206	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	109.8019	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-938.3812	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2575.7563	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1119.1150	0.2100	235.0142	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2199.2206	0.2100	461.8363	(264)
Space and water heating			696.8505	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	109.8019	0.1443	15.8478	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-407.8591	0.1343	-54.7615	
PV Unit electricity exported	-530.5221	0.1258	-66.7429	
Total			-121.5044	(269)
Total CO2, kg/year			603.1231	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			15.8800	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1119.1150	1.1300	1264.6000	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2199.2206	1.1300	2485.1192	(278)
Space and water heating			3749.7192	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	109.8019	1.5338	168.4179	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-407.8591	1.4962	-610.2410	
PV Unit electricity exported	-530.5221	0.4618	-244.9912	
Total			-855.2322	(283)
Total Primary energy kWh/year			3193.0057	(286)
Target Primary Energy Rate (TPER)			84.0900	(287)

Full SAP Calculation Printout

Property Reference	78449-23	**Issued on Date**	03/10/2025
Assessment Reference	001	**Prop Type Ref**	GF Flat / End
Property	4 Shepherd Street, MANCHESTER, M9 4QW		

SAP Rating	87 B	**DER**	4.57	**TER**	15.88
Environmental	97 A	**% DER < TER**			71.22
CO_2 Emissions (t/year)	0.16	**DFEE**	26.20	**TFEE**	35.74
Compliance Check	See BREL	**% DFEE < TFEE**			26.70
% DPER < TPER	42.72	**DPER**	48.17	**TPER**	84.09

Assessor Details	Mr. Daniel Goddard	**Assessor ID**	CP52-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	37.9700	(1b)	x 2.3600	(2b) =	89.6092	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	37.9700					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	89.6092	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.2232	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.6000	(17)
Infiltration rate		0.4032	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3427	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4370	0.4284	0.4198	0.3770	0.3684	0.3256	0.3256	0.3170	0.3427	0.3684	0.3856	0.4027	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0.0000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5955	0.5918	0.5881	0.5711	0.5679	0.5530	0.5530	0.5502	0.5587	0.5679	0.5743	0.5811	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door			2.1500	0.7800	1.6770			(26)
Window			4.4700	0.7282	3.2549			(27)
GF			37.9700	0.0900	3.4173	75.0000	2847.7500	(28a)
Main	38.8100	6.6200	32.1900	0.1300	4.1847	9.0000	289.7100	(29a)
Total net area of external elements Aum(A, m2)			76.7800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		12.5339			(33)
Main dwelling								
Party Wall 1			27.2200	0.0000	0.0000	20.0000	544.4000	(32)
Party Ceiling			37.9700			30.0000	1139.1000	(32b)
Timber			50.4000			9.0000	453.6000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 5274.5600 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	138.9139 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	5.1000	0.1150	0.5865
E3 Sill	5.1000	0.0170	0.0867
E4 Jamb	10.8000	0.0940	1.0152

E5 Ground floor (normal)	15.4000	0.0670	1.0318	
E7 Party floor between dwellings (in blocks of flats)	15.4000	0.0320	0.4928	
E16 Corner (normal)	12.6000	0.0680	0.8568	
E17 Corner (inverted - internal area greater than external area)	2.5200	-0.0290	-0.0731	
P1 Party wall - Ground floor	10.8000	0.0560	0.6048	
E18 Party wall between dwellings	2.5200	0.2400	0.6048	
E25 Staggered party wall between dwellings	5.0400	0.0560	0.2822	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.4886 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 18.0224 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.6086	17.4989	17.3915	16.8868	16.7924	16.3528	16.3528	16.2714	16.5221	16.7924	16.9834	17.1831	(38)
Heat transfer coeff	35.6310	35.5214	35.4139	34.9092	34.8148	34.3752	34.3752	34.2938	34.5445	34.8148	35.0058	35.2055	(39)
Average = Sum(39)m / 12 =												34.9088	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9384	0.9355	0.9327	0.9194	0.9169	0.9053	0.9053	0.9032	0.9098	0.9169	0.9219	0.9272	(40)
HLP (average)												0.9194	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.3535 (42)
Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

20.2973	19.9959	19.5714	18.7887	18.2026	17.5528	17.2017	17.6233	18.0822	18.7776	19.5764	20.2287	(42b)

Hot water usage for other uses

28.4911	27.4550	26.4190	25.3830	24.3469	23.3109	23.3109	24.3469	25.3830	26.4190	27.4550	28.4911	(42c)

Average daily hot water use (litres/day) 44.7198 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	48.7884	47.4509	45.9904	44.1717	42.5496	40.8637	40.5126	41.9702	43.4652	45.1966	47.0315	48.7198	(44)
Energy conte	77.2689	67.5695	70.6855	60.4688	57.2799	50.2466	48.9965	51.9679	53.5969	61.3314	67.0049	76.2834	(45)
Energy content (annual)										Total = Sum(45)m =		742.7004	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	65.6786	57.4341	60.0827	51.3985	48.6879	42.7096	41.6470	44.1727	45.5574	52.1317	56.9542	64.8409	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	65.6786	57.4341	60.0827	51.3985	48.6879	42.7096	41.6470	44.1727	45.5574	52.1317	56.9542	64.8409	(64)
									Total per year (kWh/year) = Sum(64)m =			631.2953	(64)
12Total per year (kWh/year)												631	(64)
Electric shower(s)	37.5695	33.4747	36.5531	34.8822	35.5367	33.8986	35.0285	35.5367	34.8822	36.5531	35.8657	37.5695	(64a)
					Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =							427.3504	(64a)
Heat gains from water heating, kWh/month	25.8120	22.7272	24.1589	21.5702	21.0562	19.1521	19.1689	19.9274	20.1099	22.1712	23.2050	25.6026	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	67.4075	74.6297	67.4075	69.6544	67.4075	69.6544	67.4075	67.4075	69.6544	67.4075	69.6544	67.4075	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	116.4640	117.6725	114.6270	108.1436	99.9594	92.2675	87.1288	85.9203	88.9657	95.4491	103.6333	111.3253	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	(71)
Water heating gains (Table 5)	34.6936	33.8202	32.4717	29.9586	28.3013	26.6001	25.7646	26.7841	27.9304	29.8000	32.2292	34.4121	(72)
Total internal gains	261.8673	269.4248	257.8085	251.0589	238.9705	231.8243	223.6032	223.4142	229.8529	235.9589	248.8192	256.4472	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	1.6600	10.6334	0.3000	0.0000	0.7700	4.0775	(74)
South	2.8100	46.7521	0.3000	0.0000	0.7700	30.3472	(78)

Solar gains	34.4247	57.4932	76.5512	92.8227	103.2145	102.4289	98.7471	90.8067	82.0549	62.8828	41.0019	29.6220	(83)
Total gains	296.2921	326.9180	334.3597	343.8816	342.1850	334.2532	322.3503	314.2208	311.9078	298.8418	289.8211	286.0692	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	41.1203	41.2472	41.3723	41.9705	42.0843	42.6225	42.6225	42.7236	42.4135	42.0843	41.8546	41.6172	
alpha	3.7414	3.7498	3.7582	3.7980	3.8056	3.8415	3.8415	3.8482	3.8276	3.8056	3.7903	3.7745	
util living area	0.9616	0.9434	0.9201	0.8643	0.7695	0.6062	0.4552	0.4838	0.6756	0.8604	0.9381	0.9656	(86)
MIT	19.5652	19.7799	20.0458	20.4175	20.7184	20.9188	20.9790	20.9731	20.8711	20.5112	20.0017	19.5367	(87)
Th 2	20.1350	20.1374	20.1398	20.1511	20.1532	20.1630	20.1630	20.1648	20.1592	20.1532	20.1489	20.1444	(88)
util rest of house	0.9552	0.9342	0.9065	0.8407	0.7285	0.5414	0.3742	0.4029	0.6149	0.8320	0.9265	0.9599	(89)
MIT 2	18.8340	19.0453	19.3059	19.6686	19.9435	20.1150	20.1543	20.1530	20.0775	19.7622	19.2736	18.8133	(90)
Living area fraction										fLA = Living area / (4) =		0.4772	(91)
MIT	19.1829	19.3959	19.6590	20.0260	20.3133	20.4986	20.5478	20.5444	20.4562	20.1197	19.6210	19.1585	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1829	19.3959	19.6590	20.0260	20.3133	20.4986	20.5478	20.5444	20.4562	20.1197	19.6210	19.1585	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9466	0.9248	0.8978	0.8368	0.7367	0.5682	0.4121	0.4404	0.6374	0.8308	0.9181	0.9517	(94)
Useful gains	280.4787	302.3497	300.1944	287.7694	252.0999	189.9326	132.8328	138.3722	198.7971	248.2710	266.0785	272.2629	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	530.2929	514.9126	466.0115	388.3996	299.8701	202.7656	135.7074	142.1275	219.5725	331.4250	438.3092	526.6224	(97)
Space heating kWh	185.8617	142.8423	123.3679	72.4538	35.5411	0.0000	0.0000	0.0000	0.0000	61.8666	124.0061	189.2435	(98a)
Space heating requirement - total per year (kWh/year)												935.1829	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	185.8617	142.8423	123.3679	72.4538	35.5411	0.0000	0.0000	0.0000	0.0000	61.8666	124.0061	189.2435	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												935.1829	
Space heating per m2											(98c) / (4) =	24.6295	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	323.1269	254.3765	260.6329	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8354	0.8974	0.8850	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	269.9474	228.2894	230.6489	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	361.4769	349.1434	340.9889	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	65.9012	89.9153	82.0930	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	16.4753	22.4788	20.5232	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												59.4774	(107)
Energy for space heating												24.6295	(99)
Energy for space cooling												1.5664	(108)
Total												26.1960	(109)
Fabric Energy Efficiency (DFEE)												26.2	(109)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	37.9700	(1b)	x 2.3600	(2b) =	89.6092	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	37.9700					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	89.6092	(5)

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2. Ventilation rate

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	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.2232	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	

Measured/design AP50		5.0000 (17)
Infiltration rate		0.4732 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.4022 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.5128	0.5028	0.4927	0.4424	0.4324	0.3821	0.3821	0.3720	0.4022	0.4324	0.4525	0.4726	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =		0.0000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.6315	0.6264	0.6214	0.5979	0.5935	0.5730	0.5730	0.5692	0.5809	0.5935	0.6024	0.6117	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			2.1500	1.0000	2.1500			(26)
TER Opening Type			4.4700	1.1450	5.1183			(27)
GF			37.9700	0.1300	4.9361			(28a)
Main	38.8100	6.6200	32.1900	0.1800	5.7942			(29a)
Total net area of external elements Aum(A, m2)			76.7800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		17.9986			(33)
Main dwelling								
Party Wall 1			27.2200	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		138.9139 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	5.1000	0.0500	0.2550
E3 Sill	5.1000	0.0500	0.2550
E4 Jamb	10.8000	0.0500	0.5400
E5 Ground floor (normal)	15.4000	0.1600	2.4640
E7 Party floor between dwellings (in blocks of flats)	15.4000	0.0700	1.0780
E16 Corner (normal)	12.6000	0.0900	1.1340
E17 Corner (inverted - internal area greater than external area)	2.5200	-0.0900	-0.2268
P1 Party wall - Ground floor	10.8000	0.0800	0.8640
E18 Party wall between dwellings	2.5200	0.0600	0.1512
E25 Staggered party wall between dwellings	5.0400	0.0600	0.3024

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		6.8168 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	24.8154 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	18.6739	18.5229	18.3749	17.6798	17.5497	16.9442	16.9442	16.8321	17.1774	17.5497	17.8128	18.0879	(38)
Heat transfer coeff	43.4893	43.3383	43.1903	42.4952	42.3651	41.7597	41.7597	41.6475	41.9929	42.3651	42.6282	42.9033	(39)

Average = Sum(39)m / 12 =		42.4945

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1454	1.1414	1.1375	1.1192	1.1158	1.0998	1.0998	1.0969	1.1059	1.1158	1.1227	1.1299	(40)
HLP (average)												1.1192	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy		1.3535 (42)

Hot water usage for mixer showers

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

	20.2973	19.9959	19.5714	18.7887	18.2026	17.5528	17.2017	17.6233	18.0822	18.7776	19.5764	20.2287	(42b)

Hot water usage for other uses

	28.4911	27.4550	26.4190	25.3830	24.3469	23.3109	23.3109	24.3469	25.3830	26.4190	27.4550	28.4911	(42c)

Average daily hot water use (litres/day)		44.7198 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	48.7884	47.4509	45.9904	44.1717	42.5496	40.8637	40.5126	41.9702	43.4652	45.1966	47.0315	48.7198	(44)
Energy conte	77.2689	67.5695	70.6855	60.4688	57.2799	50.2466	48.9965	51.9679	53.5969	61.3314	67.0049	76.2834	(45)

Energy content (annual)	Total = Sum(45)m =	742.7004

Distribution loss (46)m = 0.15 x (45)m

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss:

Total storage loss

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

	65.6786	57.4341	60.0827	51.3985	48.6879	42.7096	41.6470	44.1727	45.5574	52.1317	56.9542	64.8409	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

	65.6786	57.4341	60.0827	51.3985	48.6879	42.7096	41.6470	44.1727	45.5574	52.1317	56.9542	64.8409	(64)

	Total per year (kWh/year) = Sum(64)m =	631.2953 (64)
12Total per year (kWh/year)		631 (64)

Electric shower(s)

	37.5695	33.4747	36.5531	34.8822	35.5367	33.8986	35.0285	35.5367	34.8822	36.5531	35.8657	37.5695	(64a)

	Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	427.3504 (64a)

Heat gains from water heating, kWh/month

	25.8120	22.7272	24.1589	21.5702	21.0562	19.1521	19.1689	19.9274	20.1099	22.1712	23.2050	25.6026	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	65.4789	72.4945	65.4789	67.6615	65.4789	67.6615	65.4789	65.4789	67.6615	65.4789	67.6615	65.4789	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	116.4640	117.6725	114.6270	108.1436	99.9594	92.2675	87.1288	85.9203	88.9657	95.4491	103.6333	111.3253	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	(71)
Water heating gains (Table 5)													
	34.6936	33.8202	32.4717	29.9586	28.3013	26.6001	25.7646	26.7841	27.9304	29.8000	32.2292	34.4121	(72)
Total internal gains													
	259.9388	267.2895	255.8800	249.0660	237.0420	229.8314	221.6747	221.4856	227.8600	234.0304	246.8263	254.5186	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	1.6600	10.6334	0.6300	0.7000	0.7700	5.3945	(74)
South	2.8100	46.7521	0.6300	0.7000	0.7700	40.1494	(78)

Solar gains	45.5439	76.0635	101.2772	122.8044	136.5527	135.5134	130.6424	120.1373	108.5587	83.1940	54.2455	39.1899	(83)
Total gains	305.4827	343.3531	357.1572	371.8704	373.5947	365.3448	352.3171	341.6228	336.4186	317.2243	301.0719	293.7085	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	33.6900	33.8074	33.9232	34.4782	34.5840	35.0854	35.0854	35.1799	34.8906	34.5840	34.3706	34.1502	
alpha	3.2460	3.2538	3.2615	3.2985	3.3056	3.3390	3.3390	3.3453	3.3260	3.3056	3.2914	3.2767	
util living area													
	0.9643	0.9468	0.9243	0.8736	0.7877	0.6384	0.4913	0.5221	0.7085	0.8751	0.9440	0.9680	(86)
MIT	19.1188	19.3743	19.7066	20.1688	20.5619	20.8498	20.9531	20.9416	20.7735	20.2838	19.6478	19.0898	(87)
Th 2	19.9640	19.9672	19.9703	19.9852	19.9880	20.0010	20.0010	20.0034	19.9960	19.9880	19.9824	19.9765	(88)
util rest of house													
	0.9578	0.9374	0.9101	0.8487	0.7434	0.5635	0.3913	0.4231	0.6405	0.8460	0.9324	0.9622	(89)
MIT 2	18.2705	18.5226	18.8492	19.3028	19.6655	19.9142	19.9826	19.9790	19.8545	19.4196	18.8051	18.2510	(90)
Living area fraction									fLA = Living area / (4) =			0.4772	(91)
MIT	18.6753	18.9291	19.2584	19.7161	20.0933	20.3607	20.4457	20.4384	20.2931	19.8320	19.2073	18.6513	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.6753	18.9291	19.2584	19.7161	20.0933	20.3607	20.4457	20.4384	20.2931	19.8320	19.2073	18.6513	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9475	0.9256	0.8985	0.8412	0.7484	0.5919	0.4372	0.4678	0.6621	0.8408	0.9215	0.9526	(94)
Useful gains	289.4340	317.8246	320.8950	312.8213	279.6084	216.2368	154.0380	159.8259	222.7356	266.7334	277.4516	279.7745	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	625.1719	607.9967	551.0377	459.6303	355.5811	240.5635	160.5967	168.1877	260.0653	391.1152	516.1108	620.0088	(97)
Space heating kWh													
	249.7890	194.9957	171.2262	105.7025	56.5237	0.0000	0.0000	0.0000	0.0000	92.5400	171.8347	253.1343	(98a)
Space heating requirement - total per year (kWh/year)												1295.7461	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	249.7890	194.9957	171.2262	105.7025	56.5237	0.0000	0.0000	0.0000	0.0000	92.5400	171.8347	253.1343	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1295.7461	
Space heating per m2										(98c) / (4) =		34.1255	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	392.5407	309.0214	316.5212	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7767	0.8469	0.8304	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	304.8873	261.7117	262.8314	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	399.9784	386.2413	375.0344	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	68.4656	92.6500	83.4790	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	17.1164	23.1625	20.8697	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												61.1486	(107)
Energy for space heating												34.1255	(99)
Energy for space cooling												1.6104	(108)
Total												35.7360	(109)
Fabric Energy Efficiency (TFEE)												35.7	(109)

Full SAP Calculation Printout

Property Reference	78449-23	**Issued on Date**	03/10/2025
Assessment Reference	001	**Prop Type Ref**	GF Flat / End
Property	4 Shepherd Street, MANCHESTER, M9 4QW		

SAP Rating	87 B	**DER**	4.57	**TER**	15.88
Environmental	97 A	**% DER < TER**			71.22
CO_2 Emissions (t/year)	0.16	**DFEE**	26.20	**TFEE**	35.74
Compliance Check	See BREL	**% DFEE < TFEE**			26.70
% DPER < TPER	42.72	**DPER**	48.17	**TPER**	84.09

Assessor Details	Mr. Daniel Goddard	**Assessor ID**	CP52-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	37.9700	(1b)	x 2.3600	(2b) =	89.6092	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	37.9700					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	89.6092	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.6000	(17)
Infiltration rate		0.1800	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1530	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1951	0.1913	0.1874	0.1683	0.1645	0.1453	0.1453	0.1415	0.1530	0.1645	0.1721	0.1798	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	80.1000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2946	0.2907	0.2869	0.2678	0.2640	0.2448	0.2448	0.2410	0.2525	0.2640	0.2716	0.2793	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door			2.1500	0.7800	1.6770			(26)
Window			4.4700	0.7282	3.2549			(27)
GF			37.9700	0.0900	3.4173	75.0000	2847.7500	(28a)
Main	38.8100	6.6200	32.1900	0.1300	4.1847	9.0000	289.7100	(29a)
Total net area of external elements Aum(A, m2)			76.7800					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	12.5339			(33)
Main dwelling								
Party Wall 1			27.2200	0.0000	0.0000	20.0000	544.4000	(32)
Party Ceiling			37.9700			20.0000	759.4000	(32b)
Timber			50.4000			9.0000	453.6000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	4894.8600 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		128.9139 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total

E2 Other lintels (including other steel lintels)	5.1000	0.1150	0.5865	
E3 Sill	5.1000	0.0170	0.0867	
E4 Jamb	10.8000	0.0940	1.0152	
E5 Ground floor (normal)	15.4000	0.0670	1.0318	
E7 Party floor between dwellings (in blocks of flats)	15.4000	0.0320	0.4928	
E16 Corner (normal)	12.6000	0.0680	0.8568	
E17 Corner (inverted - internal area greater than external area)	2.5200	-0.0290	-0.0731	
P1 Party wall - Ground floor	10.8000	0.0560	0.6048	
E18 Party wall between dwellings	2.5200	0.2400	0.6048	
E25 Staggered party wall between dwellings	5.0400	0.0560	0.2822	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				5.4886 (36)
Point Thermal bridges			(36a) =	0.0000
Total fabric heat loss			(33) + (36) + (36a) =	18.0224 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	8.7109	8.5978	8.4847	7.9191	7.8060	7.2405	7.2405	7.1274	7.4667	7.8060	8.0322	8.2585	(38)
Heat transfer coeff	26.7333	26.6202	26.5071	25.9415	25.8284	25.2629	25.2629	25.1498	25.4891	25.8284	26.0546	26.2809	(39)
Average = Sum(39)m / 12 =												25.9133	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7041	0.7011	0.6981	0.6832	0.6802	0.6653	0.6653	0.6624	0.6713	0.6802	0.6862	0.6921	(40)
HLP (average)												0.6825	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.3535 (42)
Hot water usage for mixer showers	46.9130	46.2079	45.1806	43.2150	41.7644	40.1467	39.2272	40.2468	41.3644	43.1013	45.1092	46.7332 (42a)
Hot water usage for baths	20.2973	19.9959	19.5714	18.7887	18.2026	17.5528	17.2017	17.6233	18.0822	18.7776	19.5764	20.2287 (42b)
Hot water usage for other uses	28.4911	27.4550	26.4190	25.3830	24.3469	23.3109	23.3109	24.3469	25.3830	26.4190	27.4550	28.4911 (42c)
Average daily hot water use (litres/day)												87.9720 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	95.7014	93.6589	91.1710	87.3866	84.3139	81.0104	79.7399	82.2170	84.8296	88.2979	92.1406	95.4530	(44)
Energy conte	151.5676	133.3690	140.1264	119.6279	113.5028	99.6117	96.4385	101.8018	104.6034	119.8195	131.2712	149.4563	(45)
Energy content (annual)											Total = Sum(45)m =	1461.1961	
Distribution loss (46)m = 0.15 x (45)m	22.7351	20.0053	21.0190	17.9442	17.0254	14.9418	14.4658	15.2703	15.6905	17.9729	19.6907	22.4185	(46)
Water storage loss:													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8694	(55)
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	178.5190	157.7122	167.0778	145.7099	140.4542	125.6937	123.3899	128.7532	130.6854	146.7709	157.3532	176.4077	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	178.5190	157.7122	167.0778	145.7099	140.4542	125.6937	123.3899	128.7532	130.6854	146.7709	157.3532	176.4077	(64)
										Total per year (kWh/year) = Sum(64)m =		1778.5271	(64)
12Total per year (kWh/year)												1779	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	50.3962	44.3452	46.5920	39.7763	37.7397	33.1209	32.0658	33.8491	34.7806	39.8400	43.6477	49.6942	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	67.4075	74.6297	67.4075	69.6544	67.4075	69.6544	67.4075	67.4075	69.6544	67.4075	69.6544	67.4075	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	116.4640	117.6725	114.6270	108.1436	99.9594	92.2675	87.1288	85.9203	88.9657	95.4491	103.6333	111.3253	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	(71)
Water heating gains (Table 5)	67.7369	65.9899	62.6237	55.2449	50.7254	46.0012	43.0992	45.4961	48.3064	53.5483	60.6218	66.7933	(72)
Total internal gains	294.9106	301.5944	287.9606	276.3452	261.3946	251.2255	240.9378	242.1262	250.2289	259.7073	277.2118	288.8284	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	1.6600	10.6334	0.3000	0.0000	0.7700	4.0775	(74)
South	2.8100	46.7521	0.3000	0.0000	0.7700	30.3472	(78)

Solar gains	34.4247	57.4932	76.5512	92.8227	103.2145	102.4289	98.7471	90.8067	82.0549	62.8828	41.0019	29.6220	(83)

Total gains	329.3353	359.0876	364.5117	369.1679	364.6091	353.6543	339.6849	332.9329	332.2838	322.5901	318.2137	318.4504	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	50.8610	51.0771	51.2951	52.4134	52.6429	53.8214	53.8214	54.0634	53.3437	52.6429	52.1858	51.7366	
alpha	4.3907	4.4051	4.4197	4.4942	4.5095	4.5881	4.5881	4.6042	4.5562	4.5095	4.4791	4.4491	
util living area													
	0.9144	0.8792	0.8364	0.7461	0.6208	0.4502	0.3259	0.3457	0.5152	0.7367	0.8661	0.9217	(86)
MIT	20.2346	20.4047	20.5805	20.7960	20.9263	20.9869	20.9976	20.9969	20.9750	20.8355	20.5412	20.2170	(87)
Th 2	20.3372	20.3399	20.3425	20.3557	20.3583	20.3716	20.3716	20.3742	20.3663	20.3583	20.3530	20.3478	(88)
util rest of house													
	0.9040	0.8655	0.8182	0.7200	0.5853	0.4081	0.2799	0.2994	0.4717	0.7058	0.8492	0.9120	(89)
MIT 2	19.4516	19.6617	19.8772	20.1419	20.2886	20.3614	20.3702	20.3723	20.3458	20.1922	19.8425	19.4386	(90)
Living area fraction										fLA = Living area / (4) =		0.4772	(91)
MIT	19.8253	20.0163	20.2128	20.4541	20.5929	20.6599	20.6696	20.6704	20.6460	20.4992	20.1759	19.8101	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8253	20.0163	20.2128	20.4541	20.5929	20.6599	20.6696	20.6704	20.6460	20.4992	20.1759	19.8101	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8950	0.8582	0.8143	0.7241	0.5985	0.4276	0.3018	0.3214	0.4911	0.7128	0.8442	0.9031	(94)
Useful gains	294.7694	308.1703	296.8354	267.3117	218.2127	151.2102	102.5117	107.0005	163.1723	229.9382	268.6467	287.6024	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	415.0416	402.3978	363.4868	299.7308	229.6904	153.0909	102.8099	107.3989	166.8526	255.6807	340.6889	410.2469	(97)
Space heating kWh													
	89.4825	63.3209	49.5886	23.3418	8.5394	0.0000	0.0000	0.0000	0.0000	19.1524	51.8704	91.2475	(98a)
Space heating requirement - total per year (kWh/year)												396.5434	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	89.4825	63.3209	49.5886	23.3418	8.5394	0.0000	0.0000	0.0000	0.0000	19.1524	51.8704	91.2475	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												396.5434	
Space heating per m2											(98c) / (4) =	10.4436	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Fraction of main heating from main system 2												0.0000	(203)
Fraction of total heating from main system 1												1.0000	(204)
Fraction of total heating from main system 2												0.0000	(205)
Efficiency of main space heating system 1 (in %)												100.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	89.4825	63.3209	49.5886	23.3418	8.5394	0.0000	0.0000	0.0000	0.0000	19.1524	51.8704	91.2475	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	89.4825	63.3209	49.5886	23.3418	8.5394	0.0000	0.0000	0.0000	0.0000	19.1524	51.8704	91.2475	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement													
	178.5190	157.7122	167.0778	145.7099	140.4542	125.6937	123.3899	128.7532	130.6854	146.7709	157.3532	176.4077	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month													
	55.0102	48.5986	51.4846	44.9001	43.2806	38.7322	38.0223	39.6750	40.2704	45.2271	48.4880	54.3596	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	11.3091	10.2147	11.3091	10.9443	11.3091	10.9443	11.3091	11.3091	10.9443	11.3091	10.9443	11.3091	(231)
Lighting	13.5004	10.8306	9.7517	7.1445	5.5186	4.5088	5.0343	6.5438	8.4997	11.1521	12.5962	13.8757	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												396.5434	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												324.5200	
Water heating fuel used												548.0485	(219)
Space cooling fuel												0.0000	(221)

Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.2180)		
mechanical ventilation fans (SFP = 1.2180)	133.1557	(230a)
Total electricity for the above, kWh/year	133.1557	(231)
Electricity for lighting (calculated in Appendix L)	108.9563	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	1186.7040	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	396.5434	0.1566	62.0796	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	548.0485	0.1411	77.3114	(264)
Space and water heating			139.3910	(265)
Pumps, fans and electric keep-hot	133.1557	0.1387	18.4703	(267)
Energy for lighting	108.9563	0.1443	15.7258	(268)
Total CO2, kg/year			173.5871	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.5700	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	396.5434	1.5796	626.3673	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	548.0485	1.5216	833.9227	(278)
Space and water heating			1460.2900	(279)
Pumps, fans and electric keep-hot	133.1557	1.5128	201.4379	(281)
Energy for lighting	108.9563	1.5338	167.1209	(282)
Total Primary energy kWh/year			1828.8488	(286)
Dwelling Primary energy Rate (DPER)			48.1700	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		37.9700	(1b)	x 2.3600	(2b) =	89.6092	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	37.9700						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		89.6092	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.2232	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4732	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.4022	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.5128	0.5028	0.4927	0.4424	0.4324	0.3821	0.3821	0.3720	0.4022	0.4324	0.4525	0.4726	(22b)
Effective ac	0.6315	0.6264	0.6214	0.5979	0.5935	0.5730	0.5730	0.5692	0.5809	0.5935	0.6024	0.6117	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			2.1500	1.0000	2.1500			(26)
TER Opening Type			4.4700	1.1450	5.1183			(27)
GF			37.9700	0.1300	4.9361			(28a)
Main	38.8100	6.6200	32.1900	0.1800	5.7942			(29a)
Total net area of external elements Aum(A, m2)			76.7800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		17.9986			(33)
Main dwelling								
Party Wall 1			27.2200	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 138.9139 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	5.1000	0.0500	0.2550
E3 Sill	5.1000	0.0500	0.2550
E4 Jamb	10.8000	0.0500	0.5400
E5 Ground floor (normal)	15.4000	0.1600	2.4640
E7 Party floor between dwellings (in blocks of flats)	15.4000	0.0700	1.0780
E16 Corner (normal)	12.6000	0.0900	1.1340
E17 Corner (inverted - internal area greater than external area)	2.5200	-0.0900	-0.2268
P1 Party wall - Ground floor	10.8000	0.0800	0.8640
E18 Party wall between dwellings	2.5200	0.0600	0.1512
E25 Staggered party wall between dwellings	5.0400	0.0600	0.3024

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.8168 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 24.8154 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	18.6739	18.5229	18.3749	17.6798	17.5497	16.9442	16.9442	16.8321	17.1774	17.5497	17.8128	18.0879	(38)
Heat transfer coeff	43.4893	43.3383	43.1903	42.4952	42.3651	41.7597	41.7597	41.6475	41.9929	42.3651	42.6282	42.9033	(39)

Average = Sum(39)m / 12 = 42.4945

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1454	1.1414	1.1375	1.1192	1.1158	1.0998	1.0998	1.0969	1.1059	1.1158	1.1227	1.1299	(40)
HLP (average)												1.1192	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.3535 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	46.9130	46.2079	45.1806	43.2150	41.7644	40.1467	39.2272	40.2468	41.3644	43.1013	45.1092	46.7332	(42a)
Hot water usage for baths	20.2973	19.9959	19.5714	18.7887	18.2026	17.5528	17.2017	17.6233	18.0822	18.7776	19.5764	20.2287	(42b)
Hot water usage for other uses	28.4911	27.4550	26.4190	25.3830	24.3469	23.3109	23.3109	24.3469	25.3830	26.4190	27.4550	28.4911	(42c)

Average daily hot water use (litres/day) 87.9720 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	95.7014	93.6589	91.1710	87.3866	84.3139	81.0104	79.7399	82.2170	84.8296	88.2979	92.1406	95.4530	(44)
Energy conte	151.5676	133.3690	140.1264	119.6279	113.5028	99.6117	96.4385	101.8018	104.6034	119.8195	131.2712	149.4563	(45)
Energy content (annual)										Total = Sum(45)m =		1461.1961	
Distribution loss (46)m = 0.15 x (45)m	22.7351	20.0053	21.0190	17.9442	17.0254	14.9418	14.4658	15.2703	15.6905	17.9729	19.6907	22.4185	(46)

Water storage loss:
Store volume 150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.3938 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.7527 (55)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	198.1625	175.4547	186.7213	164.7198	160.0977	144.7035	143.0334	148.3967	149.6953	166.4144	176.3631	196.0513	(62)
WWHRS	-21.4466	-18.9676	-19.8618	-16.4463	-15.3274	-13.1158	-12.2939	-13.0734	-13.5701	-15.9976	-18.1233	-21.0495	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	176.7158	156.4871	166.8596	148.2735	144.7703	131.5878	130.7394	135.3234	136.1252	150.4168	158.2397	175.0018	(64)
									Total per year (kWh/year) = Sum(64)m =			1810.5403	(64)
12Total per year (kWh/year)												1811	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	87.6721	78.0138	83.8680	75.8498	75.0156	69.1944	69.3417	71.1250	70.8541	77.1159	79.7212	86.9702	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	67.6745	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	65.4789	72.4945	65.4789	67.6615	65.4789	67.6615	65.4789	65.4789	67.6615	65.4789	67.6615	65.4789	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	116.4640	117.6725	114.6270	108.1436	99.9594	92.2675	87.1288	85.9203	88.9657	95.4491	103.6333	111.3253	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	29.7674	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	(71)
Water heating gains (Table 5)	117.8389	116.0919	112.7258	105.3469	100.8274	96.1033	93.2012	95.5981	98.4085	103.6504	110.7238	116.8954	(72)

Total internal gains	346.0841	352.5612	339.1340	327.4544	312.5681	299.3346	289.1112	290.2996	298.3381	310.8808	328.3210	340.0019	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	1.6600	10.6334	0.6300	0.7000	0.7700	5.3945	(74)
South	2.8100	46.7521	0.6300	0.7000	0.7700	40.1494	(78)

Solar gains	45.5439	76.0635	101.2772	122.8044	136.5527	135.5134	130.6424	120.1373	108.5587	83.1940	54.2455	39.1899	(83)
Total gains	391.6280	428.6248	440.4112	450.2588	449.1208	434.8480	419.7537	410.4369	406.8967	394.0747	382.5665	379.1918	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	33.6900	33.8074	33.9232	34.4782	34.5840	35.0854	35.0854	35.1799	34.8906	34.5840	34.3706	34.1502	
alpha	3.2460	3.2538	3.2615	3.2985	3.3056	3.3390	3.3390	3.3453	3.3260	3.3056	3.2914	3.2767	
util living area													
	0.9331	0.9096	0.8788	0.8155	0.7152	0.5616	0.4217	0.4466	0.6260	0.8086	0.9009	0.9383	(86)
MIT	19.4276	19.6570	19.9553	20.3546	20.6802	20.8982	20.9703	20.9634	20.8456	20.4642	19.9129	19.4026	(87)
Th 2	19.9640	19.9672	19.9703	19.9852	19.9880	20.0010	20.0010	20.0034	19.9960	19.9880	19.9824	19.9765	(88)
util rest of house													
	0.9221	0.8952	0.8589	0.7844	0.6661	0.4891	0.3323	0.3575	0.5568	0.7713	0.8829	0.9281	(89)
MIT 2	18.1741	18.4597	18.8299	19.3211	19.6950	19.9281	19.9866	19.9845	19.8771	19.4592	18.7927	18.1516	(90)
Living area fraction										fLA = Living area / (4) =		0.4772	(91)
MIT	18.7723	19.0311	19.3669	19.8143	20.1651	20.3910	20.4560	20.4517	20.3393	19.9388	19.3273	18.7486	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.7723	19.0311	19.3669	19.8143	20.1651	20.3910	20.4560	20.4517	20.3393	19.9388	19.3273	18.7486	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9066	0.8796	0.8455	0.7786	0.6753	0.5184	0.3738	0.3985	0.5816	0.7693	0.8692	0.9130	(94)
Useful gains	355.0307	377.0359	372.3463	350.5740	303.2715	225.4122	156.9122	163.5524	236.6520	303.1467	332.5204	346.2076	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	629.3890	612.4174	555.7277	463.8067	358.6268	241.8317	161.0259	168.7415	262.0066	395.6381	521.2271	624.1838	(97)
Space heating kWh													
	204.1226	158.1763	136.4358	81.5275	41.1844	0.0000	0.0000	0.0000	0.0000	68.8136	135.8688	206.8142	(98a)
Space heating requirement - total per year (kWh/year)												1032.9432	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	204.1226	158.1763	136.4358	81.5275	41.1844	0.0000	0.0000	0.0000	0.0000	68.8136	135.8688	206.8142	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1032.9432	
Space heating per m2											(98c) / (4) =	27.2042	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	204.1226	158.1763	136.4358	81.5275	41.1844	0.0000	0.0000	0.0000	0.0000	68.8136	135.8688	206.8142	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	221.1512	171.3720	147.8177	88.3288	44.6201	0.0000	0.0000	0.0000	0.0000	74.5543	147.2035	224.0674	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	176.7158	156.4871	166.8596	148.2735	144.7703	131.5878	130.7394	135.3234	136.1252	150.4168	158.2397	175.0018	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.3839	84.0839	83.6121	82.7764	81.6324	79.8000	79.8000	79.8000	79.8000	82.4221	83.7199	84.4353	(217)
Fuel for water heating, kWh/month													
	209.4188	186.1084	199.5640	179.1253	177.3442	164.8970	163.8339	169.5781	170.5829	182.4957	189.0110	207.2613	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	13.6052	10.9146	9.8274	7.2000	5.5615	4.5438	5.0734	6.5945	8.5657	11.2386	12.6940	13.9834	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-18.3889	-26.2500	-38.2205	-43.5891	-47.5889	-44.7066	-44.2359	-41.5216	-36.7467	-30.3811	-20.3628	-15.8670	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-9.4088	-19.9034	-39.7394	-59.9177	-79.4083	-79.7844	-78.7658	-66.5369	-48.6209	-28.4473	-12.5639	-7.4254	(233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1119.1150	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2199.2206	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	109.8019	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-938.3812	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2575.7563	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1119.1150	0.2100	235.0142	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2199.2206	0.2100	461.8363	(264)
Space and water heating			696.8505	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	109.8019	0.1443	15.8478	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-407.8591	0.1343	-54.7615	
PV Unit electricity exported	-530.5221	0.1258	-66.7429	
Total			-121.5044	(269)
Total CO2, kg/year			603.1231	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			15.8800	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1119.1150	1.1300	1264.6000	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2199.2206	1.1300	2485.1192	(278)
Space and water heating			3749.7192	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	109.8019	1.5338	168.4179	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-407.8591	1.4962	-610.2410	
PV Unit electricity exported	-530.5221	0.4618	-244.9912	
Total			-855.2322	(283)
Total Primary energy kWh/year			3193.0057	(286)
Target Primary Energy Rate (TPER)			84.0900	(287)

Full SAP Calculation Printout

Property Reference	78449-23	**Issued on Date**	03/10/2025
Assessment Reference	001	**Prop Type Ref**	GF Flat / End
Property	4 Shepherd Street, MANCHESTER, M9 4QW		

SAP Rating	87 B	**DER**	4.57	**TER**	15.88
Environmental	97 A	**% DER < TER**			71.22
CO_2 Emissions (t/year)	0.16	**DFEE**	26.20	**TFEE**	35.74
Compliance Check	See BREL	**% DFEE < TFEE**			26.70
% DPER < TPER	42.72	**DPER**	48.17	**TPER**	84.09

Assessor Details	Mr. Daniel Goddard	**Assessor ID**	CP52-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	37.9700 (1b)	x	2.3600 (2b)	=	89.6092	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	37.9700					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	89.6092	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.6000	(17)
Infiltration rate		0.1800	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1530	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1951	0.1913	0.1874	0.1683	0.1645	0.1453	0.1453	0.1415	0.1530	0.1645	0.1721	0.1798	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	80.1000 (23c)

Effective ac	0.2946	0.2907	0.2869	0.2678	0.2640	0.2448	0.2448	0.2410	0.2525	0.2640	0.2716	0.2793	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door			2.1500	0.7800	1.6770			(26)
Window			4.4700	0.7282	3.2549			(27)
GF			37.9700	0.0900	3.4173	75.0000	2847.7500	(28a)
Main	38.8100	6.6200	32.1900	0.1300	4.1847	9.0000	289.7100	(29a)
Total net area of external elements Aum(A, m2)			76.7800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		12.5339			(33)
Main dwelling								
Party Wall 1			27.2200	0.0000	0.0000	20.0000	544.4000	(32)
Party Ceiling			37.9700			30.0000	1139.1000	(32b)
Timber			50.4000			9.0000	453.6000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 5274.5600 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	138.9139 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total

E2 Other lintels (including other steel lintels)	5.1000	0.1150	0.5865	
E3 Sill	5.1000	0.0170	0.0867	
E4 Jamb	10.8000	0.0940	1.0152	
E5 Ground floor (normal)	15.4000	0.0670	1.0318	
E7 Party floor between dwellings (in blocks of flats)	15.4000	0.0320	0.4928	
E16 Corner (normal)	12.6000	0.0680	0.8568	
E17 Corner (inverted - internal area greater than external area)	2.5200	-0.0290	-0.0731	
P1 Party wall - Ground floor	10.8000	0.0560	0.6048	
E18 Party wall between dwellings	2.5200	0.2400	0.6048	
E25 Staggered party wall between dwellings	5.0400	0.0560	0.2822	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				5.4886 (36)
Point Thermal bridges			(36a) =	0.0000
Total fabric heat loss			(33) + (36) + (36a) =	18.0224 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	8.7109	8.5978	8.4847	7.9191	7.8060	7.2405	7.2405	7.1274	7.4667	7.8060	8.0322	8.2585	(38)
Heat transfer coeff	26.7333	26.6202	26.5071	25.9415	25.8284	25.2629	25.2629	25.1498	25.4891	25.8284	26.0546	26.2809	(39)
Average = Sum(39)m / 12 =												25.9133	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7041	0.7011	0.6981	0.6832	0.6802	0.6653	0.6653	0.6624	0.6713	0.6802	0.6862	0.6921	(40)
HLP (average)												0.6825	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.3535 (42)

Hot water usage for mixer showers

46.9130	46.2079	45.1806	43.2150	41.7644	40.1467	39.2272	40.2468	41.3644	43.1013	45.1092	46.7332	(42a)

Hot water usage for baths

20.2973	19.9959	19.5714	18.7887	18.2026	17.5528	17.2017	17.6233	18.0822	18.7776	19.5764	20.2287	(42b)

Hot water usage for other uses

28.4911	27.4550	26.4190	25.3830	24.3469	23.3109	23.3109	24.3469	25.3830	26.4190	27.4550	28.4911	(42c)

Average daily hot water use (litres/day) 87.9720 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	95.7014	93.6589	91.1710	87.3866	84.3139	81.0104	79.7399	82.2170	84.8296	88.2979	92.1406	95.4530	(44)
Energy conte	151.5676	133.3690	140.1264	119.6279	113.5028	99.6117	96.4385	101.8018	104.6034	119.8195	131.2712	149.4563	(45)
Energy content (annual)											Total = Sum(45)m =	1461.1961	
Distribution loss (46)m = 0.15 x (45)m	22.7351	20.0053	21.0190	17.9442	17.0254	14.9418	14.4658	15.2703	15.6905	17.9729	19.6907	22.4185	(46)

Water storage loss:

Store volume 200.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.6100 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.8694 (55)

Total storage loss

26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)

If cylinder contains dedicated solar storage

26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

178.5190	157.7122	167.0778	145.7099	140.4542	125.6937	123.3899	128.7532	130.6854	146.7709	157.3532	176.4077	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
178.5190	157.7122	167.0778	145.7099	140.4542	125.6937	123.3899	128.7532	130.6854	146.7709	157.3532	176.4077	(64)
									Total per year (kWh/year) = Sum(64)m =		1778.5271	(64)
Electric shower(s)													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)

Heat gains from water heating, kWh/month

50.3962	44.3452	46.5920	39.7763	37.7397	33.1209	32.0658	33.8491	34.7806	39.8400	43.6477	49.6942	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	81.2094	81.2094	81.2094	81.2094	81.2094	81.2094	81.2094	81.2094	81.2094	81.2094	81.2094	81.2094	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	15.4239	13.6994	11.1411	8.4345	6.3049	5.3229	5.7515	7.4761	10.0344	12.7409	14.8705	15.8526	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	173.8268	175.6306	171.0851	161.4084	149.1932	137.7127	130.0430	128.2392	132.7847	142.4614	154.6766	166.1571	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	44.4744	44.4744	44.4744	44.4744	44.4744	44.4744	44.4744	44.4744	44.4744	44.4744	44.4744	44.4744	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)	
Losses e.g. evaporation (negative values) (Table 5)	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	(71)
Water heating gains (Table 5)	67.7369	65.9899	62.6237	55.2449	50.7254	46.0012	43.0992	45.4961	48.3064	53.5483	60.6218	66.7933	(72)
Total internal gains	328.5318	326.8640	316.3941	296.6319	277.7677	260.5810	250.4379	252.7556	262.6697	280.2949	301.7131	320.3472	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	1.6600	10.6334	0.3000	0.0000	0.7700	4.0775	(74)
South	2.8100	46.7521	0.3000	0.0000	0.7700	30.3472	(78)

Solar gains	34.4247	57.4932	76.5512	92.8227	103.2145	102.4289	98.7471	90.8067	82.0549	62.8828	41.0019	29.6220	(83)
Total gains	362.9565	384.3573	392.9453	389.4546	380.9821	363.0099	349.1850	343.5623	344.7246	343.1777	342.7150	349.9692	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	54.8064	55.0393	55.2741	56.4791	56.7265	57.9964	57.9964	58.2572	57.4816	56.7265	56.2339	55.7499	
alpha	4.6538	4.6693	4.6849	4.7653	4.7818	4.8664	4.8664	4.8838	4.8321	4.7818	4.7489	4.7167	
util living area	0.8966	0.8653	0.8149	0.7274	0.6029	0.4405	0.3175	0.3356	0.5003	0.7131	0.8480	0.9057	(86)
MIT	20.3979	20.5220	20.6802	20.8467	20.9473	20.9911	20.9985	20.9981	20.9829	20.8803	20.6421	20.3781	(87)
Th 2	20.3372	20.3399	20.3425	20.3557	20.3583	20.3716	20.3716	20.3742	20.3663	20.3583	20.3530	20.3478	(88)
util rest of house	0.8841	0.8500	0.7947	0.6999	0.5671	0.3988	0.2725	0.2904	0.4572	0.6809	0.8291	0.8942	(89)
MIT 2	19.6489	19.8013	19.9931	20.1977	20.3096	20.3649	20.3707	20.3731	20.3527	20.2401	19.9605	19.6338	(90)
Living area fraction										fLA = Living area / (4) =		0.4772	(91)
MIT	20.0063	20.1452	20.3210	20.5074	20.6139	20.6637	20.6703	20.6714	20.6534	20.5456	20.2858	19.9890	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0063	20.1452	20.3210	20.5074	20.6139	20.6637	20.6703	20.6714	20.6534	20.5456	20.2858	19.9890	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8774	0.8452	0.7940	0.7066	0.5816	0.4183	0.2939	0.3119	0.4769	0.6905	0.8271	0.8873	(94)
Useful gains	318.4459	324.8700	312.0150	275.1839	221.5661	151.8488	102.6393	107.1708	164.4048	236.9802	283.4456	310.5269	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	419.8826	405.8303	366.3541	301.1140	230.2325	153.1869	102.8286	107.4237	167.0410	256.8787	343.5509	414.9477	(97)
Space heating kWh	75.4689	54.4053	40.4283	18.6697	6.4478	0.0000	0.0000	0.0000	0.0000	14.8045	43.2758	77.6891	(98a)
Space heating requirement - total per year (kWh/year)												331.1894	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	75.4689	54.4053	40.4283	18.6697	6.4478	0.0000	0.0000	0.0000	0.0000	14.8045	43.2758	77.6891	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												331.1894	
Space heating per m2										(98c) / (4) =		8.7224	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	75.4689	54.4053	40.4283	18.6697	6.4478	0.0000	0.0000	0.0000	0.0000	14.8045	43.2758	77.6891	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	75.4689	54.4053	40.4283	18.6697	6.4478	0.0000	0.0000	0.0000	0.0000	14.8045	43.2758	77.6891	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	178.5190	157.7122	167.0778	145.7099	140.4542	125.6937	123.3899	128.7532	130.6854	146.7709	157.3532	176.4077	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month	55.0102	48.5986	51.4846	44.9001	43.2806	38.7322	38.0223	39.6750	40.2704	45.2271	48.4880	54.3596	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	11.3091	10.2147	11.3091	10.9443	11.3091	10.9443	11.3091	11.3091	10.9443	11.3091	10.9443	11.3091	(231)
Lighting	13.5004	10.8306	9.7517	7.1445	5.5186	4.5088	5.0343	6.5438	8.4997	11.1521	12.5962	13.8757	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year

Space heating fuel - main system 1	331.1894	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	324.5200	
Water heating fuel used	548.0485	(219)
Space cooling fuel	0.0000	(221)

Electricity for pumps and fans:

(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.2180)		
mechanical ventilation fans (SFP = 1.2180)	133.1557	(230a)
Total electricity for the above, kWh/year	133.1557	(231)
Electricity for lighting (calculated in Appendix L)	108.9563	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	1121.3499	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	331.1894	16.4900	54.6131	(240)
Space heating - main system 2	0.0000	16.4900	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	548.0485	16.4900	90.3732	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	133.1557	16.4900	21.9574	(249)
Energy for lighting	108.9563	16.4900	17.9669	(250)
Additional standing charges			0.0000	(251)
Total energy cost			184.9106	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.8023	(257)
SAP value		86.9945	
SAP rating (Section 12)		87	(258)
SAP band		B	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	331.1894	0.1568	51.9241	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	548.0485	0.1411	77.3114	(264)
Space and water heating			129.2355	(265)
Pumps, fans and electric keep-hot	133.1557	0.1387	18.4703	(267)
Energy for lighting	108.9563	0.1443	15.7258	(268)
Total CO2, kg/year			163.4316	(272)
CO2 emissions per m2			4.3000	(273)
EI value			97.3605	
EI rating			97	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	37.9700 (1b)	x	2.3600 (2b)	=	89.6092	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 37.9700						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	89.6092	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.6000	(17)
Infiltration rate		0.1800	(18)
Number of sides sheltered		2	(19)

Shelter factor (20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.1530 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.6000	4.5000	4.5000	4.1000	4.2000	3.7000	3.5000	3.5000	3.7000	4.1000	4.1000	4.2000	(22)
Wind factor	1.1500	1.1250	1.1250	1.0250	1.0500	0.9250	0.8750	0.8750	0.9250	1.0250	1.0250	1.0500	(22a)
Adj infilt rate	0.1759	0.1721	0.1721	0.1568	0.1607	0.1415	0.1339	0.1339	0.1415	0.1568	0.1568	0.1607	(22b)

Balanced mechanical ventilation with heat recovery
If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 80.1000 (23c)

Effective ac	0.2754	0.2716	0.2716	0.2563	0.2601	0.2410	0.2334	0.2334	0.2410	0.2563	0.2563	0.2601	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Door			2.1500	0.7800	1.6770			(26)
Window			4.4700	0.7282	3.2549			(27)
GF			37.9700	0.0900	3.4173	75.0000	2847.7500	(28a)
Main	38.8100	6.6200	32.1900	0.1300	4.1847	9.0000	289.7100	(29a)
Total net area of external elements Aum(A, m2)			76.7800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		12.5339			(33)
Main dwelling								
Party Wall 1			27.2200	0.0000	0.0000	20.0000	544.4000	(32)
Party Ceiling			37.9700			30.0000	1139.1000	(32b)
Timber			50.4000			9.0000	453.6000	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 5274.5600 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 138.9139 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	5.1000	0.1150	0.5865
E3 Sill	5.1000	0.0170	0.0867
E4 Jamb	10.8000	0.0940	1.0152
E5 Ground floor (normal)	15.4000	0.0670	1.0318
E7 Party floor between dwellings (in blocks of flats)	15.4000	0.0320	0.4928
E16 Corner (normal)	12.6000	0.0680	0.8568
E17 Corner (inverted - internal area greater than external area)	2.5200	-0.0290	-0.0731
P1 Party wall - Ground floor	10.8000	0.0560	0.6048
E18 Party wall between dwellings	2.5200	0.2400	0.6048
E25 Staggered party wall between dwellings	5.0400	0.0560	0.2822

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.4886 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 18.0224 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	8.1453	8.0322	8.0322	7.5798	7.6929	7.1274	6.9011	6.9011	7.1274	7.5798	7.5798	7.6929	(38)
Heat transfer coeff	26.1678	26.0546	26.0546	25.6022	25.7153	25.1498	24.9236	24.9236	25.1498	25.6022	25.6022	25.7153	(39)
Average = Sum(39)m / 12 =												25.5551	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6892	0.6862	0.6862	0.6743	0.6773	0.6624	0.6564	0.6564	0.6624	0.6743	0.6743	0.6773	(40)
HLP (average)												0.6730	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.3535 (42)
Hot water usage for mixer showers

46.9130	46.2079	45.1806	43.2150	41.7644	40.1467	39.2272	40.2468	41.3644	43.1013	45.1092	46.7332	(42a)

Hot water usage for baths

20.2973	19.9959	19.5714	18.7887	18.2026	17.5528	17.2017	17.6233	18.0822	18.7776	19.5764	20.2287	(42b)

Hot water usage for other uses

28.4911	27.4550	26.4190	25.3830	24.3469	23.3109	23.3109	24.3469	25.3830	26.4190	27.4550	28.4911	(42c)

Average daily hot water use (litres/day) 87.9720 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	95.7014	93.6589	91.1710	87.3866	84.3139	81.0104	79.7399	82.2170	84.8296	88.2979	92.1406	95.4530	(44)
Energy conte	151.5676	133.3690	140.1264	119.6279	113.5028	99.6117	96.4385	101.8018	104.6034	119.8195	131.2712	149.4563	(45)
Energy content (annual)										Total = Sum(45)m =		1461.1961	
Distribution loss (46)m = 0.15 x (45)m	22.7351	20.0053	21.0190	17.9442	17.0254	14.9418	14.4658	15.2703	15.6905	17.9729	19.6907	22.4185	(46)

Water storage loss:
Store volume 200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.6100 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.8694 (55)
Total storage loss

26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)

If cylinder contains dedicated solar storage

26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

178.5190	157.7122	167.0778	145.7099	140.4542	125.6937	123.3899	128.7532	130.6854	146.7709	157.3532	176.4077	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
178.5190	157.7122	167.0778	145.7099	140.4542	125.6937	123.3899	128.7532	130.6854	146.7709	157.3532	176.4077	(64)
									Total per year (kWh/year) = Sum(64)m =		1778.5271	(64)
Electric shower(s)													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)

Heat gains from water heating, kWh/month

	50.3962	44.3452	46.5920	39.7763	37.7397	33.1209	32.0658	33.8491	34.7806	39.8400	43.6477	49.6942 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	81.2094	81.2094	81.2094	81.2094	81.2094	81.2094	81.2094	81.2094	81.2094	81.2094	81.2094	81.2094	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	15.4239	13.6994	11.1411	8.4345	6.3049	5.3229	5.7515	7.4761	10.0344	12.7409	14.8705	15.8526	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	173.8268	175.6306	171.0851	161.4084	149.1932	137.7127	130.0430	128.2392	132.7847	142.4614	154.6766	166.1571	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	44.4744	44.4744	44.4744	44.4744	44.4744	44.4744	44.4744	44.4744	44.4744	44.4744	44.4744	44.4744	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	(71)

Water heating gains (Table 5)

	67.7369	65.9899	62.6237	55.2449	50.7254	46.0012	43.0992	45.4961	48.3064	53.5483	60.6218	66.7933	(72)

Total internal gains

	328.5318	326.8640	316.3941	296.6319	277.7677	260.5810	250.4379	252.7556	262.6697	280.2949	301.7131	320.3472	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	1.6600	8.9975	0.3000	0.0000	0.7700	3.4502	(74)
South	2.8100	39.5594	0.3000	0.0000	0.7700	25.6784	(78)

Solar gains	29.1286	51.1051	71.7667	88.4909	96.2260	97.3074	91.9550	83.2877	77.7738	58.1190	36.0320	26.8008	(83)
Total gains	357.6604	377.9691	388.1608	385.1229	373.9937	357.8884	342.3929	336.0432	340.4435	338.4139	337.7451	347.1481	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	55.9909	56.2339	56.2339	57.2277	56.9760	58.2572	58.7860	58.7860	58.2572	57.2277	57.2277	56.9760	
alpha	4.7327	4.7489	4.7489	4.8152	4.7984	4.8838	4.9191	4.9191	4.8838	4.8152	4.8152	4.7984	
util living area	0.8896	0.8570	0.8087	0.7107	0.5767	0.4180	0.3195	0.3327	0.5002	0.7067	0.8374	0.8972	(86)
MIT	20.4584	20.5740	20.7064	20.8702	20.9596	20.9935	20.9986	20.9983	20.9837	20.8896	20.6846	20.4468	(87)
Th 2	20.3504	20.3530	20.3530	20.3636	20.3610	20.3742	20.3795	20.3795	20.3742	20.3636	20.3636	20.3610	(88)
util rest of house	0.8764	0.8410	0.7882	0.6823	0.5392	0.3756	0.2748	0.2873	0.4576	0.6739	0.8174	0.8849	(89)
MIT 2	19.7342	19.8757	20.0334	20.2315	20.3247	20.3695	20.3787	20.3785	20.3612	20.2553	20.0204	19.7292	(90)
Living area fraction										fLA = Living area / (4) =		0.4772	(91)
MIT	20.0798	20.2090	20.3546	20.5363	20.6277	20.6673	20.6745	20.6743	20.6583	20.5580	20.3374	20.0716	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0798	20.2090	20.3546	20.5363	20.6277	20.6673	20.6745	20.6743	20.6583	20.5580	20.3374	20.0716	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8705	0.8372	0.7882	0.6902	0.5551	0.3956	0.2961	0.3089	0.4771	0.6842	0.8166	0.8787	(94)
Useful gains	311.3320	316.4182	305.9558	265.7987	207.5867	141.5702	101.3711	103.8133	162.4356	231.5270	275.7897	305.0532	(95)
Ext temp.	4.7000	5.3000	6.7000	9.3000	12.3000	15.0000	16.6000	16.5000	14.1000	10.8000	7.5000	4.6000	(96)
Heat loss rate W	402.4542	388.4482	355.7653	287.6738	214.1499	142.5307	101.5522	104.0382	164.9399	249.8256	328.6654	397.8573	(97)
Space heating kWh	67.7949	48.4042	37.0583	15.7501	4.8830	0.0000	0.0000	0.0000	0.0000	13.6142	38.0705	69.0462	(98a)
Space heating requirement - total per year (kWh/year)												294.6213	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	67.7949	48.4042	37.0583	15.7501	4.8830	0.0000	0.0000	0.0000	0.0000	13.6142	38.0705	69.0462	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												294.6213	
Space heating per m2											(98c) / (4) =	7.7593	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	67.7949	48.4042	37.0583	15.7501	4.8830	0.0000	0.0000	0.0000	0.0000	13.6142	38.0705	69.0462	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	67.7949	48.4042	37.0583	15.7501	4.8830	0.0000	0.0000	0.0000	0.0000	13.6142	38.0705	69.0462	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)

Space heating fuel (secondary)
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (215)
Space heating fuel used, main system 2 0.0000 (213)

Water heating
Water heating requirement
178.5190 157.7122 167.0778 145.7099 140.4542 125.6937 123.3899 128.7532 130.6854 146.7709 157.3532 176.4077 (64)
Efficiency of water heater 324.5200 (216)
(217)m 324.5200 324.5200 324.5200 324.5200 324.5200 324.5200 324.5200 324.5200 324.5200 324.5200 324.5200 324.5200 (217)
Fuel for water heating, kWh/month
55.0102 48.5986 51.4846 44.9001 43.2806 38.7322 38.0223 39.6750 40.2704 45.2271 48.4880 54.3596 (219)
Space cooling fuel requirement
(221)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (221)
Pumps and Fa 11.3091 10.2147 11.3091 10.9443 11.3091 10.9443 11.3091 11.3091 10.9443 11.3091 10.9443 11.3091 (231)
Lighting 13.5004 10.8306 9.7517 7.1445 5.5186 4.5088 5.0343 6.5438 8.4997 11.1521 12.5962 13.8757 (232)
Electricity generated by PVs (Appendix M) (negative quantity)
(233a)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)
(234a)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)
(235a)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)
(235c)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)
(233b)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)
(234b)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)
(235b)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)
(235d)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (235d)
Annual totals kWh/year
Space heating fuel - main system 1 294.6213 (211)
Space heating fuel - main system 2 0.0000 (213)
Space heating fuel - secondary 0.0000 (215)
Efficiency of water heater 324.5200
Water heating fuel used 548.0485 (219)
Space cooling fuel 0.0000 (221)

Electricity for pumps and fans:
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.2180)
mechanical ventilation fans (SFP = 1.2180) 133.1557 (230a)
Total electricity for the above, kWh/year 133.1557 (231)
Electricity for lighting (calculated in Appendix L) 108.9563 (232)

Energy saving/generation technologies (Appendices M ,N and Q)
PV generation 0.0000 (233)
Wind generation 0.0000 (234)
Hydro-electric generation (Appendix N) 0.0000 (235a)
Electricity generated - Micro CHP (Appendix N) 0.0000 (235)
Appendix Q - special features
Energy saved or generated -0.0000 (236)
Energy used 0.0000 (237)
Total delivered energy for all uses 1084.7819 (238)

10a. Fuel costs - using BEDF prices (583)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	294.6213	28.4300	83.7608	(240)
Space heating - main system 2	0.0000	28.4300	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	548.0485	28.4300	155.8102	(247)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(247a)
Pumps, fans and electric keep-hot	133.1557	28.4300	37.8562	(249)
Energy for lighting	108.9563	28.4300	30.9763	(250)
Additional standing charges			0.0000	(251)
Total energy cost			308.4035	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	294.6213	0.1569	46.2167	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	548.0485	0.1411	77.3114	(264)
Space and water heating			123.5281	(265)
Pumps, fans and electric keep-hot	133.1557	0.1387	18.4703	(267)
Energy for lighting	108.9563	0.1443	15.7258	(268)
Total CO2, kg/year			157.7242	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	294.6213	1.5807	465.7210	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	548.0485	1.5216	833.9227	(278)
Space and water heating			1299.6438	(279)
Pumps, fans and electric keep-hot	133.1557	1.5128	201.4379	(281)
Energy for lighting	108.9563	1.5338	167.1209	(282)
Total Primary energy kWh/year			1668.2025	(286)

SAP 10 EPC IMPROVEMENTS

001

Current energy efficiency rating: B 87
Current environmental impact rating: A 97

N Solar water heating Not applicable
U Solar photovoltaic panels Not applicable
V2 Wind turbine Not applicable

Recommended measures: SAP change Cost change CO2 change
(none)

Typical annual savings | Energy efficiency | Environmental impact

Recommended measures
(none)

Total Savings £0 0.00 kg/m²

Potential energy efficiency rating: B 87
Potential environmental impact rating: A 97

Fuel prices for cost data on this page from database revision number 583 TEST (01 Oct 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, West Pennines (England)):

	Current	Potential	Saving
Electricity	£308	£308	£0
Space heating	£122	£122	£0
Water heating	£156	£156	£0
Lighting	£31	£31	£0
Total cost of fuels	£308	£308	£0
Total cost of uses	£309	£309	£0
Delivered energy	29 kWh/m²	29 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.2 tonnes	0.2 tonnes	0.0 tonnes
CO2 emissions per m²	4 kg/m²	4 kg/m²	0 kg/m²
Primary energy	44 kWh/m²	44 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	37.9700	(1b)	x 2.3600	(2b) =	89.6092	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	37.9700					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	89.6092	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.6000	(17)
Infiltration rate		0.1800	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1530	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1951	0.1913	0.1874	0.1683	0.1645	0.1453	0.1453	0.1415	0.1530	0.1645	0.1721	0.1798	(22b)

Balanced mechanical ventilation with heat recovery
If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 80.1000 (23c)

Effective ac	0.2946	0.2907	0.2869	0.2678	0.2640	0.2448	0.2448	0.2410	0.2525	0.2640	0.2716	0.2793	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Door			2.1500	0.7800	1.6770			(26)
Window			4.4700	0.7282	3.2549			(27)
GF			37.9700	0.0900	3.4173	75.0000	2847.7500	(28a)
Main	38.8100	6.2200	32.1900	0.1300	4.1847	9.0000	289.7100	(29a)
Total net area of external elements Aum(A, m2)			76.7800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		12.5339			(33)
Main dwelling								
Party Wall 1			27.2200	0.0000	0.0000	20.0000	544.4000	(32)
Party Ceiling			37.9700			30.0000	1139.1000	(32b)
Timber			50.4000			9.0000	453.6000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	5274.5600 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		138.9139 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	5.1000	0.1150	0.5865
E3 Sill	5.1000	0.0170	0.0867
E4 Jamb	10.8000	0.0940	1.0152
E5 Ground floor (normal)	15.4000	0.0670	1.0318
E7 Party floor between dwellings (in blocks of flats)	15.4000	0.0320	0.4928
E16 Corner (normal)	12.6000	0.0680	0.8568
E17 Corner (inverted - internal area greater than external area)	2.5200	-0.0290	-0.0731
P1 Party wall - Ground floor	10.8000	0.0560	0.6048
E18 Party wall between dwellings	2.5200	0.2400	0.6048
E25 Staggered party wall between dwellings	5.0400	0.0560	0.2822

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		5.4886 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	18.0224 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	8.7109	8.5978	8.4847	7.9191	7.8060	7.2405	7.2405	7.1274	7.4667	7.8060	8.0322	8.2585	(38)
Heat transfer coeff	26.7333	26.6202	26.5071	25.9415	25.8284	25.2629	25.2629	25.1498	25.4891	25.8284	26.0546	26.2809	(39)
Average = Sum(39)m / 12 =												25.9133	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7041	0.7011	0.6981	0.6832	0.6802	0.6653	0.6653	0.6624	0.6713	0.6802	0.6862	0.6921	(40)
HLP (average)												0.6825	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		1.3535 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	46.9130	46.2079	45.1806	43.2150	41.7644	40.1467	39.2272	40.2468	41.3644	43.1013	45.1092	46.7332	(42a)
Hot water usage for baths	20.2973	19.9959	19.5714	18.7887	18.2026	17.5528	17.2017	17.6233	18.0822	18.7776	19.5764	20.2287	(42b)
Hot water usage for other uses	28.4911	27.4550	26.4190	25.3830	24.3469	23.3109	23.3109	24.3469	25.3830	26.4190	27.4550	28.4911	(42c)
Average daily hot water use (litres/day)												87.9720	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	95.7014	93.6589	91.1710	87.3866	84.3139	81.0104	79.7399	82.2170	84.8296	88.2979	92.1406	95.4530	(44)
Energy conte	151.5676	133.3690	140.1264	119.6279	113.5028	99.6117	96.4385	101.8018	104.6034	119.8195	131.2712	149.4563	(45)
Energy content (annual)										Total = Sum(45)m =		1461.1961	
Distribution loss (46)m = 0.15 x (45)m	22.7351	20.0053	21.0190	17.9442	17.0254	14.9418	14.4658	15.2703	15.6905	17.9729	19.6907	22.4185	(46)
Water storage loss:													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8694	(55)
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	178.5190	157.7122	167.0778	145.7099	140.4542	125.6937	123.3899	128.7532	130.6854	146.7709	157.3532	176.4077	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	178.5190	157.7122	167.0778	145.7099	140.4542	125.6937	123.3899	128.7532	130.6854	146.7709	157.3532	176.4077	(64)
										Total per year (kWh/year) = Sum(64)m =		1778.5271	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	50.3962	44.3452	46.5920	39.7763	37.7397	33.1209	32.0658	33.8491	34.7806	39.8400	43.6477	49.6942	(65)

5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	81.2094	81.2094	81.2094	81.2094	81.2094	81.2094	81.2094	81.2094	81.2094	81.2094	81.2094	81.2094	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	15.4239	13.6994	11.1411	8.4345	6.3049	5.3229	5.7515	7.4761	10.0344	12.7409	14.8705	15.8526	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	173.8268	175.6306	171.0851	161.4084	149.1932	137.7127	130.0430	128.2392	132.7847	142.4614	154.6766	166.1571	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	44.4744	44.4744	44.4744	44.4744	44.4744	44.4744	44.4744	44.4744	44.4744	44.4744	44.4744	44.4744	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	(71)
Water heating gains (Table 5)	67.7369	65.9899	62.6237	55.2449	50.7254	46.0012	43.0992	45.4961	48.3064	53.5483	60.6218	66.7933	(72)

Total internal gains

	328.5318	326.8640	316.3941	296.6319	277.7677	260.5810	250.4379	252.7556	262.6697	280.2949	301.7131	320.3472 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	1.6600	10.6334	0.3000	0.0000	0.7700	4.0775	(74)
South	2.8100	46.7521	0.3000	0.0000	0.7700	30.3472	(78)

Solar gains	34.4247	57.4932	76.5512	92.8227	103.2145	102.4289	98.7471	90.8067	82.0549	62.8828	41.0019	29.6220 (83)
Total gains	362.9565	384.3573	392.9453	389.4546	380.9821	363.0099	349.1850	343.5623	344.7246	343.1777	342.7150	349.9692 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	54.8064	55.0393	55.2741	56.4791	56.7265	57.9964	57.9964	58.2572	57.4816	56.7265	56.2339	55.7499	
alpha	4.6538	4.6693	4.6849	4.7653	4.7818	4.8664	4.8664	4.8838	4.8321	4.7818	4.7489	4.7167	
util living area	0.8966	0.8653	0.8149	0.7274	0.6029	0.4405	0.3175	0.3356	0.5003	0.7131	0.8480	0.9057	(86)
MIT	20.3979	20.5220	20.6802	20.8467	20.9473	20.9911	20.9985	20.9981	20.9829	20.8803	20.6421	20.3781	(87)
Th 2	20.3372	20.3399	20.3425	20.3557	20.3583	20.3716	20.3716	20.3742	20.3663	20.3583	20.3530	20.3478	(88)
util rest of house	0.8841	0.8500	0.7947	0.6999	0.5671	0.3988	0.2725	0.2904	0.4572	0.6809	0.8291	0.8942	(89)
MIT 2	19.6489	19.8013	19.9931	20.1977	20.3096	20.3649	20.3707	20.3731	20.3527	20.2401	19.9605	19.6338	(90)
Living area fraction										fLA = Living area / (4) =		0.4772	(91)
MIT	20.0063	20.1452	20.3210	20.5074	20.6139	20.6637	20.6703	20.6714	20.6534	20.5456	20.2858	19.9890	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0063	20.1452	20.3210	20.5074	20.6139	20.6637	20.6703	20.6714	20.6534	20.5456	20.2858	19.9890	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8774	0.8452	0.7940	0.7066	0.5816	0.4183	0.2939	0.3119	0.4769	0.6905	0.8271	0.8873	(94)
Useful gains	318.4459	324.8700	312.0150	275.1839	221.5661	151.8488	102.6393	107.1708	164.4048	236.9802	283.4456	310.5269	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	419.8826	405.8303	366.3541	301.1140	230.2325	153.1869	102.8286	107.4237	167.0410	256.8787	343.5509	414.9477	(97)
Space heating kWh	75.4689	54.4053	40.4283	18.6697	6.4478	0.0000	0.0000	0.0000	0.0000	14.8045	43.2758	77.6891	(98a)
Space heating requirement - total per year (kWh/year)												331.1894	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	75.4689	54.4053	40.4283	18.6697	6.4478	0.0000	0.0000	0.0000	0.0000	14.8045	43.2758	77.6891	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												331.1894	
Space heating per m2											(98c) / (4) =	8.7224	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Fraction of main heating from main system 2	0.0000 (203)
Fraction of total heating from main system 1	1.0000 (204)
Fraction of total heating from main system 2	0.0000 (205)
Efficiency of main space heating system 1 (in %)	100.0000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	75.4689	54.4053	40.4283	18.6697	6.4478	0.0000	0.0000	0.0000	0.0000	14.8045	43.2758	77.6891	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	75.4689	54.4053	40.4283	18.6697	6.4478	0.0000	0.0000	0.0000	0.0000	14.8045	43.2758	77.6891	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	178.5190	157.7122	167.0778	145.7099	140.4542	125.6937	123.3899	128.7532	130.6854	146.7709	157.3532	176.4077	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month	55.0102	48.5986	51.4846	44.9001	43.2806	38.7322	38.0223	39.6750	40.2704	45.2271	48.4880	54.3596	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	11.3091	10.2147	11.3091	10.9443	11.3091	10.9443	11.3091	11.3091	10.9443	11.3091	10.9443	11.3091	(231)
Lighting	13.5004	10.8306	9.7517	7.1445	5.5186	4.5088	5.0343	6.5438	8.4997	11.1521	12.5962	13.8757	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)

Electricity generated by PVs (Appendix M) (negative quantity)

(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	331.1894	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	324.5200	
Water heating fuel used	548.0485	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.2180)		
mechanical ventilation fans (SFP = 1.2180)	133.1557	(230a)
Total electricity for the above, kWh/year	133.1557	(231)
Electricity for lighting (calculated in Appendix L)	108.9563	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	1121.3499	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	331.1894	16.4900	54.6131	(240)
Space heating - main system 2	0.0000	16.4900	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	548.0485	16.4900	90.3732	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	133.1557	16.4900	21.9574	(249)
Energy for lighting	108.9563	16.4900	17.9669	(250)
Additional standing charges			0.0000	(251)
Total energy cost			184.9106	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.8023	(257)
SAP value		86.9945	
SAP rating (Section 12)		87	(258)
SAP band		B	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	331.1894	0.1568	51.9241	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	548.0485	0.1411	77.3114	(264)
Space and water heating			129.2355	(265)
Pumps, fans and electric keep-hot	133.1557	0.1387	18.4703	(267)
Energy for lighting	108.9563	0.1443	15.7258	(268)
Total CO2, kg/year			163.4316	(272)
CO2 emissions per m2			4.3000	(273)
EI value			97.3605	
EI rating			97	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		37.9700	(1b)	x 2.3600	(2b) =	89.6092	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	37.9700						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		89.6092	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.6000	(17)
Infiltration rate		0.1800	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1530	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.6000	4.5000	4.5000	4.1000	4.2000	3.7000	3.5000	3.5000	3.7000	4.1000	4.1000	4.2000	(22)
Wind factor	1.1500	1.1250	1.1250	1.0250	1.0500	0.9250	0.8750	0.8750	0.9250	1.0250	1.0250	1.0500	(22a)
Adj infilt rate	0.1759	0.1721	0.1721	0.1568	0.1607	0.1415	0.1339	0.1339	0.1415	0.1568	0.1568	0.1607	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	80.1000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2754	0.2716	0.2716	0.2563	0.2601	0.2410	0.2334	0.2334	0.2410	0.2563	0.2563	0.2601	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door			2.1500	0.7800	1.6770			(26)
Window			4.4700	0.7282	3.2549			(27)
GF			37.9700	0.0900	3.4173	75.0000	2847.7500	(28a)
Main	38.8100	6.2200	32.1900	0.1300	4.1847	9.0000	289.7100	(29a)
Total net area of external elements Aum(A, m2)			76.7800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		12.5339			(33)
Main dwelling								
Party Wall 1			27.2200	0.0000	0.0000	20.0000	544.4000	(32)
Party Ceiling			37.9700			30.0000	1139.1000	(32b)
Timber			50.4000			9.0000	453.6000	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		5274.5600	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							138.9139	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	5.1000	0.1150	0.5865
E3 Sill	5.1000	0.0170	0.0867
E4 Jamb	10.8000	0.0940	1.0152
E5 Ground floor (normal)	15.4000	0.0670	1.0318
E7 Party floor between dwellings (in blocks of flats)	15.4000	0.0320	0.4928
E16 Corner (normal)	12.6000	0.0680	0.8568
E17 Corner (inverted - internal area greater than external area)	2.5200	-0.0290	-0.0731
P1 Party wall - Ground floor	10.8000	0.0560	0.6048
E18 Party wall between dwellings	2.5200	0.2400	0.6048
E25 Staggered party wall between dwellings	5.0400	0.0560	0.2822

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		5.4886 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	18.0224 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	8.1453	8.0322	8.0322	7.5798	7.6929	7.1274	6.9011	6.9011	7.1274	7.5798	7.5798	7.6929	(38)
Heat transfer coeff	26.1678	26.0546	26.0546	25.6022	25.7153	25.1498	24.9236	24.9236	25.1498	25.6022	25.6022	25.7153	(39)
Average = Sum(39)m / 12 =												25.5551	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6892	0.6862	0.6862	0.6743	0.6773	0.6624	0.6564	0.6564	0.6624	0.6743	0.6743	0.6773	(40)
HLP (average)												0.6730	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.3535	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	46.9130	46.2079	45.1806	43.2150	41.7644	40.1467	39.2272	40.2468	41.3644	43.1013	45.1092	46.7332	(42a)
Hot water usage for baths	20.2973	19.9959	19.5714	18.7887	18.2026	17.5528	17.2017	17.6233	18.0822	18.7776	19.5764	20.2287	(42b)
Hot water usage for other uses	28.4911	27.4550	26.4190	25.3830	24.3469	23.3109	23.3109	24.3469	25.3830	26.4190	27.4550	28.4911	(42c)
Average daily hot water use (litres/day)												87.9720	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	95.7014	93.6589	91.1710	87.3866	84.3139	81.0104	79.7399	82.2170	84.8296	88.2979	92.1406	95.4530	(44)
Energy conte	151.5676	133.3690	140.1264	119.6279	113.5028	99.6117	96.4385	101.8018	104.6034	119.8195	131.2712	149.4563	(45)
Energy content (annual)										Total = Sum(45)m =		1461.1961	
Distribution loss (46)m = 0.15 x (45)m	22.7351	20.0053	21.0190	17.9442	17.0254	14.9418	14.4658	15.2703	15.6905	17.9729	19.6907	22.4185	(46)

Water storage loss:		
Store volume	200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):	1.6100	(48)
Temperature factor from Table 2b	0.5400	(49)
Enter (49) or (54) in (55)	0.8694	(55)

Total storage loss

	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (56)

If cylinder contains dedicated solar storage

	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)

Total heat required for water heating calculated for each month

	178.5190	157.7122	167.0778	145.7099	140.4542	125.6937	123.3899	128.7532	130.6854	146.7709	157.3532	176.4077 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)

Output from w/h

	178.5190	157.7122	167.0778	145.7099	140.4542	125.6937	123.3899	128.7532	130.6854	146.7709	157.3532	176.4077 (64)

Total per year (kWh/year) = Sum(64)m = 1778.5271 (64)

Electric shower(s)

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

	50.3962	44.3452	46.5920	39.7763	37.7397	33.1209	32.0658	33.8491	34.7806	39.8400	43.6477	49.6942 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	81.2094	81.2094	81.2094	81.2094	81.2094	81.2094	81.2094	81.2094	81.2094	81.2094	81.2094	81.2094	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	15.4239	13.6994	11.1411	8.4345	6.3049	5.3229	5.7515	7.4761	10.0344	12.7409	14.8705	15.8526	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	173.8268	175.6306	171.0851	161.4084	149.1932	137.7127	130.0430	128.2392	132.7847	142.4614	154.6766	166.1571	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	44.4744	44.4744	44.4744	44.4744	44.4744	44.4744	44.4744	44.4744	44.4744	44.4744	44.4744	44.4744	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	-54.1396	(71)

Water heating gains (Table 5)

	67.7369	65.9899	62.6237	55.2449	50.7254	46.0012	43.0992	45.4961	48.3064	53.5483	60.6218	66.7933	(72)

Total internal gains

	328.5318	326.8640	316.3941	296.6319	277.7677	260.5810	250.4379	252.7556	262.6697	280.2949	301.7131	320.3472	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	1.6600	8.9975	0.3000	0.0000	0.7700	3.4502	(74)
South	2.8100	39.5594	0.3000	0.0000	0.7700	25.6784	(78)

Solar gains	29.1286	51.1051	71.7667	88.4909	96.2260	97.3074	91.9550	83.2877	77.7738	58.1190	36.0320	26.8008	(83)
Total gains	357.6604	377.9691	388.1608	385.1229	373.9937	357.8884	342.3929	336.0432	340.4435	338.4139	337.7451	347.1481	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	55.9909	56.2339	56.2339	57.2277	56.9760	58.2572	58.7860	58.7860	58.2572	57.2277	57.2277	56.9760	
alpha	4.7327	4.7489	4.7489	4.8152	4.7984	4.8838	4.9191	4.9191	4.8838	4.8152	4.8152	4.7984	
util living area	0.8896	0.8570	0.8087	0.7107	0.5767	0.4180	0.3195	0.3327	0.5002	0.7067	0.8374	0.8972	(86)
MIT	20.4584	20.5740	20.7064	20.8702	20.9596	20.9935	20.9986	20.9983	20.9837	20.8896	20.6846	20.4468	(87)
Th 2	20.3504	20.3530	20.3530	20.3636	20.3610	20.3742	20.3795	20.3795	20.3742	20.3636	20.3636	20.3610	(88)
util rest of house	0.8764	0.8410	0.7882	0.6823	0.5392	0.3756	0.2748	0.2873	0.4576	0.6739	0.8174	0.8849	(89)
MIT 2	19.7342	19.8757	20.0334	20.2315	20.3247	20.3695	20.3787	20.3785	20.3612	20.2553	20.0204	19.7292	(90)
Living area fraction										fLA = Living area / (4) =		0.4772	(91)
MIT	20.0798	20.2090	20.3546	20.5363	20.6277	20.6673	20.6745	20.6743	20.6583	20.5580	20.3374	20.0716	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0798	20.2090	20.3546	20.5363	20.6277	20.6673	20.6745	20.6743	20.6583	20.5580	20.3374	20.0716	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8705	0.8372	0.7882	0.6902	0.5551	0.3956	0.2961	0.3089	0.4771	0.6842	0.8166	0.8787	(94)
Useful gains	311.3320	316.4182	305.9558	265.7987	207.5867	141.5702	101.3711	103.8133	162.4356	231.5270	275.7897	305.0532	(95)
Ext temp.	4.7000	5.3000	6.7000	9.3000	12.3000	15.0000	16.6000	16.5000	14.1000	10.8000	7.5000	4.6000	(96)
Heat loss rate W	402.4542	388.4482	355.7653	287.6738	214.1499	142.5307	101.5522	104.0382	164.9399	249.8256	328.6654	397.8573	(97)
Space heating kWh	67.7949	48.4042	37.0583	15.7501	4.8830	0.0000	0.0000	0.0000	0.0000	13.6142	38.0705	69.0462	(98a)

Space heating requirement - total per year (kWh/year) 294.6213

Solar heating kWh

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)

Solar heating contribution - total per year (kWh/year) 0.0000

Space heating kWh

	67.7949	48.4042	37.0583	15.7501	4.8830	0.0000	0.0000	0.0000	0.0000	13.6142	38.0705	69.0462	(98c)

Space heating requirement after solar contribution - total per year (kWh/year) 294.6213

Space heating per m2 (98c) / (4) = 7.7593 (99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (201)

Fraction of space heat from main system(s)												1.0000	(202)
Fraction of main heating from main system 2												0.0000	(203)
Fraction of total heating from main system 1												1.0000	(204)
Fraction of total heating from main system 2												0.0000	(205)
Efficiency of main space heating system 1 (in %)												100.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	67.7949	48.4042	37.0583	15.7501	4.8830	0.0000	0.0000	0.0000	0.0000	13.6142	38.0705	69.0462	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	67.7949	48.4042	37.0583	15.7501	4.8830	0.0000	0.0000	0.0000	0.0000	13.6142	38.0705	69.0462	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement													
	178.5190	157.7122	167.0778	145.7099	140.4542	125.6937	123.3899	128.7532	130.6854	146.7709	157.3532	176.4077	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month													
	55.0102	48.5986	51.4846	44.9001	43.2806	38.7322	38.0223	39.6750	40.2704	45.2271	48.4880	54.3596	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	11.3091	10.2147	11.3091	10.9443	11.3091	10.9443	11.3091	11.3091	10.9443	11.3091	10.9443	11.3091	(231)
Lighting	13.5004	10.8306	9.7517	7.1445	5.5186	4.5088	5.0343	6.5438	8.4997	11.1521	12.5962	13.8757	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												294.6213	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												324.5200	
Water heating fuel used												548.0485	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.2180)													
mechanical ventilation fans (SFP = 1.2180)												133.1557	(230a)
Total electricity for the above, kWh/year												133.1557	(231)
Electricity for lighting (calculated in Appendix L)												108.9563	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												1084.7819	(238)

10a. Fuel costs - using BEDF prices (583)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	294.6213	28.4300	83.7608	(240)
Space heating - main system 2	0.0000	28.4300	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	548.0485	28.4300	155.8102	(247)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(247a)
Pumps, fans and electric keep-hot	133.1557	28.4300	37.8562	(249)
Energy for lighting	108.9563	28.4300	30.9763	(250)
Additional standing charges			0.0000	(251)
Total energy cost			308.4035	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	294.6213	0.1569	46.2167	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	548.0485	0.1411	77.3114	(264)
Space and water heating			123.5281	(265)
Pumps, fans and electric keep-hot	133.1557	0.1387	18.4703	(267)
Energy for lighting	108.9563	0.1443	15.7258	(268)
Total CO2, kg/year			157.7242	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	294.6213	1.5807	465.7210	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	548.0485	1.5216	833.9227	(278)
Space and water heating			1299.6438	(279)
Pumps, fans and electric keep-hot	133.1557	1.5128	201.4379	(281)
Energy for lighting	108.9563	1.5338	167.1209	(282)
Total Primary energy kWh/year			1668.2025	(286)

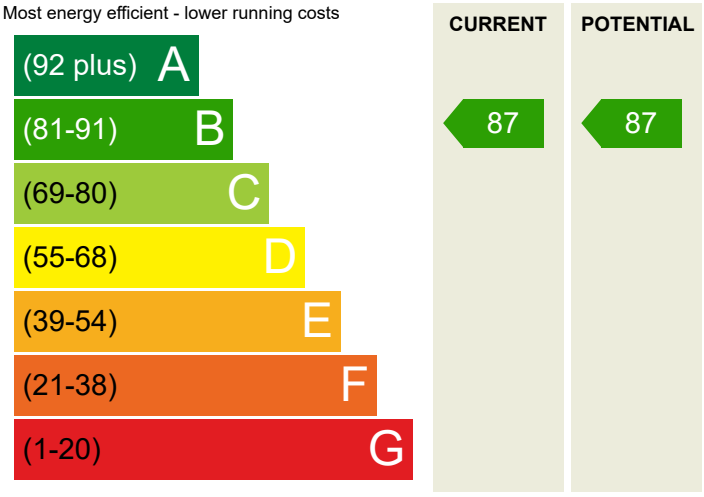
Energy Report

Dwelling Address	4 Shepherd Street, MANCHESTER, M9 4QW
Reference	78449-23-001
Assessment Date	02/07/2025
Submission Date	18/08/2025
Property Type	Flat, End-Terrace
Total Floor Area	38

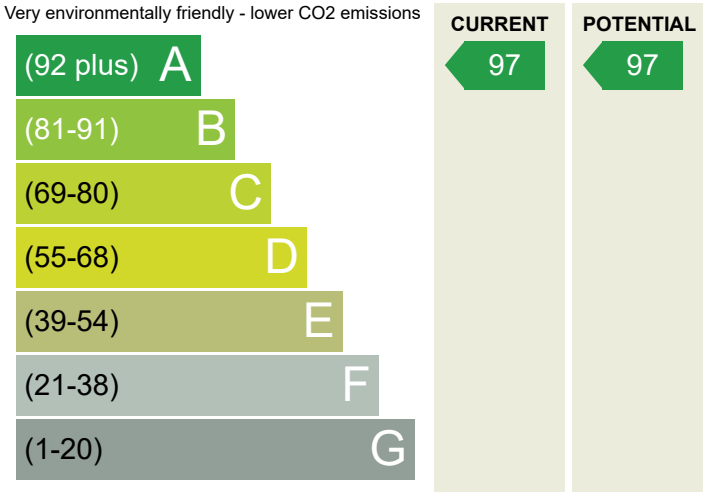
This Energy Report has been generated using the UK's National Calculation Methodology for dwellings, Standard Assessment Procedure (SAP). This methodology is used to assess the energy efficiency of dwellings which is calculated based on a dwelling's heating, hot water, ventilation and lighting usage.

This document is not an Energy Performance Certificate (EPC) as required by the Energy Performance of Buildings Regulations

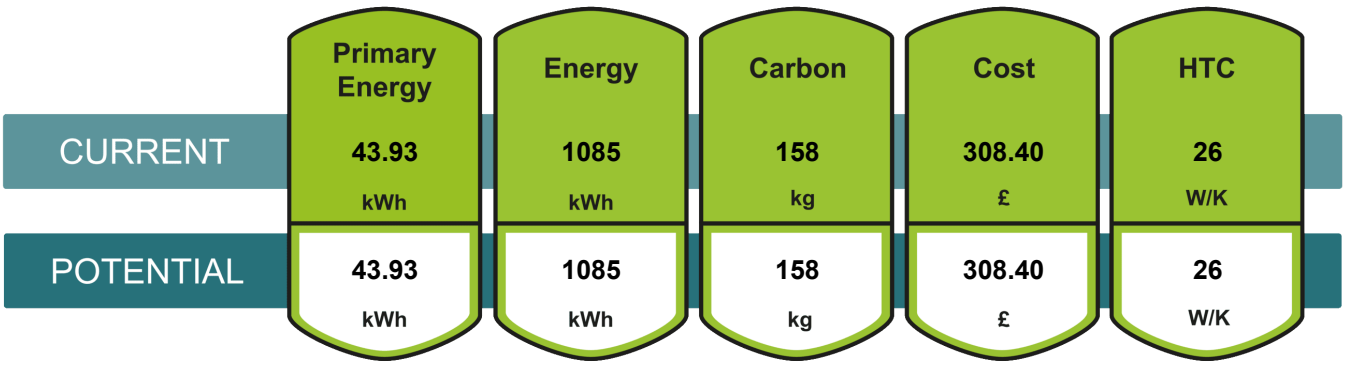
Energy Efficiency Rating



Carbon Dioxide (CO2) Emissions Rating



Additional ratings for your home



Energy Report

Breakdown of property's energy performance

Each feature is assessed as one of the following:

Very Poor	Poor	Average	Good	Very Good

Feature	Description	Energy Performance
Walls	Average thermal transmittance 0.13 W/m²K	Very Good
Floor	Average thermal transmittance 0.09 W/m²K	Very Good
Windows	High performance glazing	Very Good
Main heating	Room heaters, electric	Very Poor
Main heating controls	Programmer and room thermostat	Good
Secondary heating	None	
Hot water	From main system	Very Good
Lighting	Good lighting efficiency	Good
Air tightness	Air permeability [AP50] = 3.6 m³/h.m² (as tested)	Good

Recommendations

The recommended measures provided below will help to improve the energy efficiency of the dwelling.
To reach the dwelling's potential energy rating all of the recommended measures shown below would need to be installed.
Having these measures installed individually or in any other order may give a different result when compared with the cumulative potential rating.

Recommended measures	Cumulative savings (per year)	Cumulative rating	Typical costs	Incremental savings (per year)	Cumulative CO2 rating

The typical cost is based on average installation prices across the country so may not be representative of the actual costs in your area.

Estimated energy costs of the dwelling

Energy Report

The table below shows the estimated running costs of the space and water heating and lighting within the dwelling. It does not include the energy used from household appliances. The estimated annual costs after potential improvements indicates the total energy cost if all recommended measures named above were installed.

	Estimated annual costs	Estimated annual costs after potential improvements	Potential future savings
Lighting	£31	£31	
Heating	£122	£122	
Hot Water	£156	£156	
New Technologies e.g. Impact of PV	£0	£0	
TOTAL	£308	£308	

Estimated energy use and potential savings

Space Heating
295
kWh per year

Water Heating
548
kWh per year

About this document

Created by:	
Company/Trading name:	
Phone number:	
Email address:	

Disclaimer

This Energy Report should not under any circumstances be treated as a Condition Survey and cannot be used to indicate that any element of the dwelling (e.g.heating system) is working correctly.
This Energy Report must not be used in situations where an Energy Performance Certificate (EPC) is required.
This Energy Report is generated from a set of data inputs which may not reflect the actual dimensions, services or construction of the dwelling.
The calculation used to generate this report reflects the SAP Methodology current at the time of report generation.

Glossary terms for additional metrics

Primary Energy	The measure of the energy required for lighting, heating and hot water in a property. This includes the efficiency of the property's heating system, power station efficiency for electricity and the energy used to produce the fuel and deliver it to the property.
Energy Used	The estimated amount of fuel energy for lighting, heating and hot water for the property. The estimate is based on typical usage which is likely to be different to actual consumption.
Carbon (CO2)	The current emissions based on the energy estimates.
Cost	The estimated cost of energy. The cost of each unit of fuel is based on an industry standard which is likely to be different to those the occupier actually pays.
Heat Transfer Coefficient	Heat flow through the property envelope where internal and external temperatures are different.

Building Regulations England Part L (BREL) Compliance Report

Approved Document L1 2021 Edition, England assessed by Array SAP 10 program, Array

Date: Fri 03 Oct 2025 15:03:32

Project Information			
Assessed By	Paul Goddard	Building Type	Flat, End-terrace
OCDEA Registration	EES/005113	Assessment Date	2025-10-03

Dwelling Details			
Assessment Type	As built	Total Floor Area	49 m^2
Site Reference	78449-24	Plot Reference	001
Address	2 Shepherd Street, MANCHESTER, M9 4QW		

Client Details	
Name	-
Company	John Southworth
Address	Unit 10, Charles Street, DUKINFIELD, SK16 4SD

This report covers items included within the SAP calculations. It is not a complete report of regulations compliance.

1a Target emission rate and dwelling emission rate		
Fuel for main heating system	Electricity	
Target carbon dioxide emission rate	*15.24 $kgCO_2/m^2$*	
Dwelling carbon dioxide emission rate	5.77 $kgCO_2/m^2$	OK
1b Target primary energy rate and dwelling primary energy		
Target primary energy	*80.53 kWh_{PE}/m^2*	
Dwelling primary energy	60.34 kWh_{PE}/m^2	OK
1c Target fabric energy efficiency and dwelling fabric energy efficiency		
Target fabric energy efficiency	*41.0 kWh/m^2*	
Dwelling fabric energy efficiency	35.8 kWh/m^2	OK

2a Fabric U-values				
Element	***Maximum permitted average U-Value [W/m^2K]***	**Dwelling average U-Value [W/m^2K]**	**Element with highest individual U-Value**	
External walls	*0.26*	0.13	Walls (1) (0.13)	OK
Party walls	*0.2*	0	Party Wall (1) (0)	**N/A**
Curtain walls	*1.6*	0	N/A	**N/A**
Floors	*0.18*	0.11	Exposed Floor (0.14)	OK
Roofs	*0.16*	0.11	Roof (2) (0.12)	OK
Windows, doors, and roof windows	*1.6*	0.76	Front (0.78)	OK
Rooflights	*2.2*	N/A	N/A	**N/A**

2b Envelope elements (better than typically expected values are flagged with a subsequent (!))		
Name	**Net area [m^2]**	**U-Value [W/m^2K]**
Exposed wall: Walls (1)	64.51	0.13 **(!)**
Party wall: Party Wall (1)	22.38	0 **(!)**
Ground floor: GF, GF	3.02	0.09 **(!)**
Party floor: Exposed Floor, Exposed Floor	1.61	0.14
Exposed roof: Roof (1)	45.85	0.11
Exposed roof: Roof (2)	3.02	0.12

2c Openings (better than typically expected values are flagged with a subsequent (!))				
Name	**Area [m^2]**	**Orientation**	**Frame factor**	**U-Value [W/m^2K]**
Front, Door	2.15	South	N/A	0.78 **(!)**
Front, Window	2.05	South	1.0	0.75 **(!)**
Rear, Window	2.86	North	1.0	0.75 **(!)**

2d Thermal bridging (better than typically expected values are flagged with a subsequent (!))				
Building part **1**: Thermal bridging calculated from linear thermal transmittances for each junction				
Main element	**Junction detail**	**Source**	**Psi value [W/mK]**	**Drawing / reference**
External wall	E2: Other lintels (including other steel lintels)	Calculated by person with suitable expertise	0.115	Thermal Bridge Report
External wall	E3: Sill	Calculated by person with suitable	0.017 **(!)**	Thermal Bridge

Main element	Junction detail	Source	Psi value [W/mK]	Drawing / reference
		expertise		Report
External wall	E4: Jamb	Calculated by person with suitable expertise	0.094	Thermal Bridge Report
External wall	E5: Ground floor (normal)	Calculated by person with suitable expertise	0.067	Thermal Bridge Report
External wall	E7: Party floor between dwellings (in blocks of flats)	Calculated by person with suitable expertise	0.032 **(!)**	Thermal Bridge Report
External wall	E16: Corner (normal)	Calculated by person with suitable expertise	0.068	Thermal Bridge Report
External wall	E17: Corner (inverted - internal area greater than external area)	Calculated by person with suitable expertise	-0.029 **(!)**	Thermal Bridge Report
Party wall	P1: Ground floor	Calculated by person with suitable expertise	0.056	Thermal Bridge Report
External wall	E18: Party wall between dwellings	SAP table default	0.24	Thermal Bridge Report
External wall	E25: Staggered party wall between dwellings	Calculated by person with suitable expertise	0.056	Thermal Bridge Report
External wall	E20: Exposed floor (normal)	SAP table default	0.32	K1
External wall	E21: Exposed floor (inverted)	SAP table default	0.32	K1
External wall	E6: Intermediate floor within a dwelling	Calculated by person with suitable expertise	0.032 **(!)**	Thermal Bridge Report
External wall	E10: Eaves (insulation at ceiling level)	Calculated by person with suitable expertise	0.042	TRISCO
External wall	E12: Gable (insulation at ceiling level)	Calculated by person with suitable expertise	0.077	Thermal Bridge Report
External wall	E14: Flat roof	Calculated by person with suitable expertise	0.205	Thermal Bridge Report
External wall	E24: Eaves (insulation at ceiling level - inverted)	SAP table default	0.15	K1
Party wall	P4: Roof (insulation at ceiling level)	Calculated by person with suitable expertise	0.102	Thermal Bridge Report
Party wall	P5: Roof (insulation at rafter level)	SAP table default	0.48	K1

3 Air permeability (better than typically expected values are flagged with a subsequent (!))		
Maximum permitted air permeability at 50Pa	*8 m^3/hm^2*	
Dwelling air permeability at 50Pa	2.79 m^3/hm^2, Measured value **(!)**	OK
Air permeability test certificate reference		

4 Space heating	
Main heating system 1: Room heaters - Electricity	
Efficiency	100.0%
Emitter type	
Flow temperature	
System type	Panel, convector or radiant heaters
Manufacturer	
Model	
Commissioning	
Main heating system 2: Heat pump with radiators or underfloor heating - Electricity	
Efficiency	0.0%
Emitter type	
Flow temperature	
System type	Heat Pump
Manufacturer	Vaillant Group UK Ltd
Model	aroSTOR 200ltr
Commissioning	
Secondary heating system: N/A	
Fuel	N/A
Efficiency	N/A
Commissioning	

5 Hot water		
Cylinder/store - type: N/A		
Capacity	N/A	
Declared heat loss	N/A	
Primary pipework insulated	N/A	
Manufacturer		
Model		
Commissioning		
Waste water heat recovery system 1 - type: N/A		
Efficiency		
Manufacturer		
Model		

6 Controls		
Main heating 1 - type: Programmer and room thermostats		
Function		
Ecodesign class		
Manufacturer		
Model		
Main heating 2 - type: Not applicable		
Function		
Ecodesign class		
Manufacturer		
Model		
Water heating - type: Cylinder thermostat and HW separately timed		
Manufacturer		
Model		

7 Lighting		
Minimum permitted light source efficacy	*75 lm/W*	
Lowest light source efficacy	75 lm/W	**OK**
External lights control	N/A	

8 Mechanical ventilation		
System type: Balanced whole-house mechanical ventilation with heat recovery		
Maximum permitted specific fan power	*1.5 W/(l/s)*	
Specific fan power	0.87 W/(l/s)	**OK**
Minimum permitted heat recovery efficiency	*73%*	
Heat recovery efficiency	89%	**OK**
Manufacturer/Model	DV96 Adroit	
Commissioning		

9 Local generation
N/A

10 Heat networks
N/A

11 Supporting documentary evidence	
Documentary evidence identified in 11.1 and 11.2 is needed to confirm the data values used for any calculations undertaken, manufacturer declarations made, and tests performed as reflected in this "As built" BREL Compliance Report are correct. 11.1 SAP Conventions, Appendix 1 (documentary evidence) schedules the minimum documentary evidence required. 11.2 Indicative photographic evidence of key stages during construction (guidance within Approved Document L, Volume 1 – Appendix B) that confirms the products identified in this BREL Compliance Report are used in this dwelling, and workmanship is of sufficient quality to support the calculated values claimed in 2a to 2d.	

12 Declarations

a. Assessor Declaration

This declaration by the assessor is confirmation that the contents of this BREL Compliance Report are a true and accurate reflection based upon the design and construction information submitted for this dwelling for the purpose of carrying out the assessment, and that the supporting documentary evidence (identified in 11.1 and 11.2) pursuant to Part L of the Building Regulations 2010 (as amended) has been reviewed in the course of preparing this BREL Compliance Report.	

Signed:	Assessor ID:
Name:	Date:

b. Client Declaration

This declaration by the client is confirmation that the dwelling has been constructed and completed according to the specifications set out in this BREL Compliance Report, and that photographic evidence of key stages, as described in 11.2, has been provided to the Assessor for this dwelling.	

Signed:	Organisation:
Name:	Date:

Full SAP Calculation Printout

Property Reference	78449-24	**Issued on Date**	03/10/2025
Assessment Reference	001	**Prop Type Ref**	Top Flat / End
Property	2 Shepherd Street, MANCHESTER, M9 4QW		

SAP Rating	81 B	**DER**	5.77	**TER**	15.24
Environmental	96 A	**% DER < TER**			62.14
CO_2 Emissions (t/year)	0.27	**DFEE**	35.82	**TFEE**	41.02
Compliance Check	See BREL	**% DFEE < TFEE**			12.68
% DPER < TPER	25.08	**DPER**	60.34	**TPER**	80.53

Assessor Details	Mr. Daniel Goddard	**Assessor ID**	CP52-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	3.0200 (1b)	x	2.8500 (2b)	=	8.6070	(1b) - (3b)
First floor	45.8500 (1c)	x	2.5200 (2c)	=	115.5420	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	48.8700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	124.1490	(5)

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2. Ventilation rate

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				m3 per hour
Number of open chimneys			0 * 80 =	0.0000 (6a)
Number of open flues			0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire			0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler			0 * 20 =	0.0000 (6d)
Number of flues attached to other heater			0 * 35 =	0.0000 (6e)
Number of blocked chimneys			0 * 20 =	0.0000 (6f)
Number of intermittent extract fans			0 * 10 =	0.0000 (7a)
Number of passive vents			0 * 10 =	0.0000 (7b)
Number of flueless gas fires			0 * 40 =	0.0000 (7c)
				Air changes per hour
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =			0.0000 / (5) =	0.0000 (8)
Pressure test				Yes
Pressure Test Method				Blower Door
Measured/design AP50				2.7900 (17)
Infiltration rate				0.1395 (18)
Number of sides sheltered				2 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =	0.1186 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1512	0.1482	0.1453	0.1304	0.1275	0.1126	0.1126	0.1097	0.1186	0.1275	0.1334	0.1393	(22b)

Balanced mechanical ventilation with heat recovery		
If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =		80.1000 (23c)

Effective ac	0.2507	0.2477	0.2448	0.2299	0.2270	0.2121	0.2121	0.2092	0.2181	0.2270	0.2329	0.2388	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door			2.1500	0.7800	1.6770			(26)
Window			4.9100	0.7282	3.5752			(27)
GF			3.0200	0.0900	0.2718	75.0000	226.5000	(28a)
Exposed Floor			1.6100	0.1400	0.2254	20.0000	32.2000	(28b)
Main	71.5671	7.0600	64.5071	0.1300	8.3859	9.0000	580.5639	(29a)
PIJ	45.8500		45.8500	0.1100	5.0435	9.0000	412.6500	(30)
Flat	3.0200		3.0200	0.1200	0.3624	9.0000	27.1800	(30)
Total net area of external elements Aum(A, m2)			125.0671					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.5413			(33)
Main dwelling								
Party Wall 1			22.3800	0.0000	0.0000	20.0000	447.6000	(32)
Party Floor 1			37.9700			30.0000	1139.1000	(32d)
Timber			50.4000			9.0000	453.6000	(32c)
Internal Floor 1			6.2700			18.0000	112.8600	(32d)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 3432.2539 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 70.2323 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	5.1100	0.1150	0.5877
E3 Sill	5.1100	0.0170	0.0869
E4 Jamb	13.8000	0.0940	1.2972
E5 Ground floor (normal)	3.5100	0.0670	0.2352
E7 Party floor between dwellings (in blocks of flats)	17.0200	0.0320	0.5446
E16 Corner (normal)	20.8200	0.0680	1.4158
E17 Corner (inverted - internal area greater than external area)	5.0400	-0.0290	-0.1462
P1 Party wall - Ground floor	3.5100	0.0560	0.1966
E18 Party wall between dwellings	5.7000	0.2400	1.3680
E25 Staggered party wall between dwellings	5.0400	0.0560	0.2822
E20 Exposed floor (normal)	2.5400	0.3200	0.8128
E21 Exposed floor (inverted)	2.5400	0.3200	0.8128
E6 Intermediate floor within a dwelling	7.4100	0.0320	0.2371
E10 Eaves (insulation at ceiling level)	11.0600	0.0420	0.4645
E12 Gable (insulation at ceiling level)	13.3700	0.0770	1.0295
E14 Flat roof	3.5100	0.2050	0.7195
E24 Eaves (insulation at ceiling level - inverted)	2.0100	0.1500	0.3015
P4 Party wall - Roof (insulation at ceiling level)	4.9100	0.1020	0.5008
P5 Party wall - Roof (insulation at rafter level)	1.5000	0.4800	0.7200

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 11.4665 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 31.0078 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	10.2703	10.1488	10.0274	9.4201	9.2987	8.6915	8.6915	8.5700	8.9344	9.2987	9.5416	9.7845	(38)
Heat transfer coeff	41.2781	41.1566	41.0352	40.4279	40.3065	39.6993	39.6993	39.5778	39.9421	40.3065	40.5494	40.7923	(39)

Average = Sum(39)m / 12 = 40.3976

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8447	0.8422	0.8397	0.8273	0.8248	0.8123	0.8123	0.8099	0.8173	0.8248	0.8297	0.8347	(40)
HLP (average)												0.8266	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.6569 (42)
Hot water usage for mixer showers

52.0000	51.2186	50.0798	47.9010	46.2932	44.5001	43.4809	44.6110	45.8498	47.7751	50.0006	51.8008	(42a)

Hot water usage for baths

22.4849	22.1510	21.6808	20.8137	20.1645	19.4446	19.0557	19.5227	20.0311	20.8014	21.6863	22.4089	(42b)

Hot water usage for other uses

31.5982	30.4492	29.3001	28.1511	27.0021	25.8531	25.8531	27.0021	28.1511	29.3001	30.4492	31.5982	(42c)

Average daily hot water use (litres/day) 97.5150 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	106.0831	103.8187	101.0607	96.8659	93.4597	89.7977	88.3896	91.1358	94.0320	97.8766	102.1361	105.8079	(44)
Energy conte	168.0098	147.8365	155.3265	132.6045	125.8147	110.4167	106.8996	112.8451	115.9509	132.8176	145.5116	165.6696	(45)
Energy content (annual)										Total = Sum(45)m =		1619.7032	
Distribution loss (46)m = 0.15 x (45)m	25.2015	22.1755	23.2990	19.8907	18.8722	16.5625	16.0349	16.9268	17.3926	19.9226	21.8267	24.8504	(46)
Water storage loss:													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8694	(55)
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	194.9612	172.1797	182.2779	158.6865	152.7661	136.4987	133.8510	139.7965	142.0329	159.7690	171.5936	192.6210	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	194.9612	172.1797	182.2779	158.6865	152.7661	136.4987	133.8510	139.7965	142.0329	159.7690	171.5936	192.6210	(64)
										Total per year (kWh/year) = Sum(64)m =		1937.0342	(64)
12Total per year (kWh/year)												1937	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	55.8632	49.1556	51.6461	44.0910	41.8334	36.7136	35.5441	37.5210	38.5537	44.1619	48.3826	55.0851	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	86.2814	95.5258	86.2814	89.1574	86.2814	89.1574	86.2814	86.2814	89.1574	86.2814	89.1574	86.2814	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	144.2994	145.7968	142.0235	133.9905	123.8503	114.3199	107.9530	106.4556	110.2290	118.2620	128.4022	137.9326	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	(71)
Water heating gains (Table 5)	75.0850	73.1483	69.4168	61.2375	56.2277	50.9911	47.7744	50.4314	53.5468	59.3573	67.1981	74.0392	(72)
Total internal gains	353.5191	362.3242	345.5749	332.2387	314.2126	302.3217	289.8621	291.0218	300.7865	311.7540	332.6110	346.1064	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	2.8600	10.6334	0.3800	0.0000	0.7700	8.8984	(74)
South	2.0500	46.7521	0.3800	0.0000	0.7700	28.0433	(78)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	36.9417	62.9330	87.3999	112.5366	131.4279	133.2445	127.2808	112.4984	95.8566	69.7799	44.2182	31.6501	(83)
Total gains	390.4608	425.2572	432.9748	444.7753	445.6406	435.5662	417.1429	403.5201	396.6431	381.5339	376.8292	377.7566	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	23.0971	23.1653	23.2338	23.5828	23.6539	24.0157	24.0157	24.0894	23.8696	23.6539	23.5122	23.3722	
alpha	2.5398	2.5444	2.5489	2.5722	2.5769	2.6010	2.6010	2.6060	2.5913	2.5769	2.5675	2.5581	
util living area	0.8819	0.8537	0.8209	0.7534	0.6557	0.5135	0.3923	0.4182	0.5817	0.7534	0.8453	0.8889	(86)
MIT	18.9869	19.2500	19.5988	20.0933	20.5131	20.8197	20.9346	20.9210	20.7346	20.2239	19.5595	18.9506	(87)
Th 2	20.2148	20.2169	20.2191	20.2298	20.2319	20.2426	20.2426	20.2448	20.2384	20.2319	20.2276	20.2234	(88)
util rest of house	0.8714	0.8411	0.8049	0.7306	0.6222	0.4655	0.3319	0.3580	0.5356	0.7267	0.8302	0.8790	(89)
MIT 2	17.8437	18.1727	18.6095	19.2247	19.7282	20.0811	20.1959	20.1862	19.9900	19.3929	18.5723	17.8039	(90)
Living area fraction										fLA = Living area / (4) =		0.3912	(91)
MIT	18.2909	18.5941	18.9965	19.5645	20.0353	20.3701	20.4849	20.4737	20.2813	19.7180	18.9585	18.2525	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.2909	18.5941	18.9965	19.5645	20.0353	20.3701	20.4849	20.4737	20.2813	19.7180	18.9585	18.2525	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8401	0.8102	0.7760	0.7088	0.6130	0.4739	0.3517	0.3768	0.5383	0.7068	0.8008	0.8483	(94)
Useful gains	328.0445	344.5250	335.9849	315.2410	273.1857	206.4160	146.7132	152.0270	213.5278	269.6747	301.7798	320.4341	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	577.5194	563.6047	512.7981	431.1451	335.9667	229.0680	154.2290	161.2276	246.8948	367.5155	480.8562	573.2355	(97)
Space heating kWh	185.6093	147.2215	131.5490	83.4509	46.7091	0.0000	0.0000	0.0000	0.0000	72.7935	128.9350	188.0842	(98a)
Space heating requirement - total per year (kWh/year)												984.3526	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	185.6093	147.2215	131.5490	83.4509	46.7091	0.0000	0.0000	0.0000	0.0000	72.7935	128.9350	188.0842	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												984.3526	
Space heating per m2										(98c) / (4) =		20.1423	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Fraction of main heating from main system 2	0.0000 (203)
Fraction of total heating from main system 1	1.0000 (204)
Fraction of total heating from main system 2	0.0000 (205)
Efficiency of main space heating system 1 (in %)	100.0000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	185.6093	147.2215	131.5490	83.4509	46.7091	0.0000	0.0000	0.0000	0.0000	72.7935	128.9350	188.0842	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	185.6093	147.2215	131.5490	83.4509	46.7091	0.0000	0.0000	0.0000	0.0000	72.7935	128.9350	188.0842	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	194.9612	172.1797	182.2779	158.6865	152.7661	136.4987	133.8510	139.7965	142.0329	159.7690	171.5936	192.6210	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month	60.0768	53.0567	56.1685	48.8988	47.0745	42.0617	41.2458	43.0779	43.7671	49.2324	52.8761	59.3557	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	15.6682	14.1519	15.6682	15.1628	15.6682	15.1628	15.6682	15.6682	15.1628	15.6682	15.1628	15.6682	(231)
Lighting	17.2805	13.8631	12.4822	9.1450	7.0638	5.7712	6.4439	8.3760	10.8796	14.2746	16.1231	17.7608	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	984.3526	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	324.5200	
Water heating fuel used	596.8921	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.2180)		
mechanical ventilation fans (SFP = 1.2180)	184.4804	(230a)
Total electricity for the above, kWh/year	184.4804	(231)
Electricity for lighting (calculated in Appendix L)	139.4638	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	1905.1890	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	984.3526	0.1545	152.0627	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	596.8921	0.1411	84.2266	(264)
Space and water heating			236.2893	(265)
Pumps, fans and electric keep-hot	184.4804	0.1387	25.5897	(267)
Energy for lighting	139.4638	0.1443	20.1289	(268)
Total CO2, kg/year			282.0079	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			5.7700	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	984.3526	1.5719	1547.3245	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	596.8921	1.5218	908.3378	(278)
Space and water heating			2455.6622	(279)
Pumps, fans and electric keep-hot	184.4804	1.5128	279.0820	(281)
Energy for lighting	139.4638	1.5338	213.9142	(282)
Total Primary energy kWh/year			2948.6585	(286)
Dwelling Primary energy Rate (DPER)			60.3400	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)		
Main dwelling							
Ground floor	3.0200	(1b)	x 2.8500	(2b)	= 8.6070	(1b) - (3b)	
First floor	45.8500	(1c)	x 2.5200	(2c)	= 115.5420	(1c) - (3c)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	48.8700					(4)	
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)		= 124.1490	(5)	

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2. Ventilation rate

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	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1611	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4111	(18)

Number of sides sheltered 2 (19)

Shelter factor (20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.3494 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4455	0.4368	0.4281	0.3844	0.3756	0.3320	0.3320	0.3232	0.3494	0.3756	0.3931	0.4106	(22b)
Effective ac	0.5992	0.5954	0.5916	0.5739	0.5706	0.5551	0.5551	0.5522	0.5611	0.5706	0.5773	0.5843	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			2.1500	1.0000	2.1500			(26)
TER Opening Type			4.9100	1.1450	5.6221			(27)
GF			3.0200	0.1300	0.3926			(28a)
Exposed Floor			1.6100	0.1300	0.2093			(28b)
Main	71.5671	7.0600	64.5071	0.1800	11.6113			(29a)
PIJ	45.8500		45.8500	0.1100	5.0435			(30)
Flat	3.0200		3.0200	0.1100	0.3322			(30)
Total net area of external elements Aum(A, m2)			125.0671					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		25.3610			(33)
Main dwelling								
Party Wall 1			22.3800	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 70.2323 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	5.1100	0.0500	0.2555
E3 Sill	5.1100	0.0500	0.2555
E4 Jamb	13.8000	0.0500	0.6900
E5 Ground floor (normal)	3.5100	0.1600	0.5616
E7 Party floor between dwellings (in blocks of flats)	17.0200	0.0700	1.1914
E16 Corner (normal)	20.8200	0.0900	1.8738
E17 Corner (inverted - internal area greater than external area)	5.0400	-0.0900	-0.4536
P1 Party wall - Ground floor	3.5100	0.0800	0.2808
E18 Party wall between dwellings	5.7000	0.0600	0.3420
E25 Staggered party wall between dwellings	5.0400	0.0600	0.3024
E20 Exposed floor (normal)	2.5400	0.3200	0.8128
E21 Exposed floor (inverted)	2.5400	0.3200	0.8128
E6 Intermediate floor within a dwelling	7.4100	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	11.0600	0.0600	0.6636
E12 Gable (insulation at ceiling level)	13.3700	0.0600	0.8022
E14 Flat roof	3.5100	0.0800	0.2808
E24 Eaves (insulation at ceiling level - inverted)	2.0100	0.2400	0.4824
P4 Party wall - Roof (insulation at ceiling level)	4.9100	0.1200	0.5892
P5 Party wall - Roof (insulation at rafter level)	1.5000	0.0800	0.1200

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.8632 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 35.2242 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	24.5506	24.3928	24.2380	23.5111	23.3751	22.7419	22.7419	22.6247	22.9858	23.3751	23.6502	23.9378	(38)
Heat transfer coeff	59.7749	59.6170	59.4622	58.7353	58.5993	57.9662	57.9662	57.8489	58.2100	58.5993	58.8744	59.1621	(39)
Average = Sum(39)m / 12 =												58.7346	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2231	1.2199	1.2167	1.2019	1.1991	1.1861	1.1861	1.1837	1.1911	1.1991	1.2047	1.2106	(40)
HLP (average)												1.2019	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.6569 (42)
Hot water usage for mixer showers

52.0000	51.2186	50.0798	47.9010	46.2932	44.5001	43.4809	44.6110	45.8498	47.7751	50.0006	51.8008	(42a)

Hot water usage for baths

22.4849	22.1510	21.6808	20.8137	20.1645	19.4446	19.0557	19.5227	20.0311	20.8014	21.6863	22.4089	(42b)

Hot water usage for other uses

31.5982	30.4492	29.3001	28.1511	27.0021	25.8531	25.8531	27.0021	28.1511	29.3001	30.4492	31.5982	(42c)

Average daily hot water use (litres/day) 97.5150 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	106.0831	103.8187	101.0607	96.8659	93.4597	89.7977	88.3896	91.1358	94.0320	97.8766	102.1361	105.8079	(44)
Energy conte	168.0098	147.8365	155.3265	132.6045	125.8147	110.4167	106.8996	112.8451	115.9509	132.8176	145.5116	165.6696	(45)
Energy content (annual)										Total = Sum(45)m =		1619.7032	
Distribution loss (46)m = 0.15 x (45)m	25.2015	22.1755	23.2990	19.8907	18.8722	16.5625	16.0349	16.9268	17.3926	19.9226	21.8267	24.8504	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	214.6047	189.9222	201.9214	177.6964	172.4096	155.5086	153.4945	159.4400	161.0427	179.4125	190.6035	212.2645	(62)
WWHRS	-23.7722	-21.0244	-22.0155	-18.2297	-16.9894	-14.5380	-13.6270	-14.4910	-15.0415	-17.7323	-20.0886	-23.3320	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	190.8324	168.8978	179.9059	159.4667	155.4202	140.9706	139.8675	144.9490	146.0012	161.6802	170.5149	188.9325	(64)

Total per year (kWh/year) = Sum(64)m = 1947.4390 (64)

12Total per year (kWh/year) 1947 (64)

Electric shower(s)

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

	93.1392	82.8242	88.9220	80.1645	79.1093	72.7870	72.8200	74.7969	74.6271	81.4378	84.4561	92.3611 (65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	83.9607	92.9565	83.9607	86.7594	83.9607	86.7594	83.9607	83.9607	86.7594	83.9607	86.7594	83.9607	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	144.2994	145.7968	142.0235	133.9905	123.8503	114.3199	107.9530	106.4556	110.2290	118.2620	128.4022	137.9326	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	(71)

Water heating gains (Table 5)

	125.1871	123.2503	119.5188	111.3395	106.3297	101.0931	97.8764	100.5335	103.6488	109.4594	117.3001	124.1412	(72)

Total internal gains

	404.3005	412.8569	396.3563	382.9427	364.9940	350.0257	337.6434	338.8031	348.4905	362.5354	383.3150	396.8878	(73)

---

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	2.8600	10.6334	0.6300	0.7000	0.7700	9.2941	(74)
South	2.0500	46.7521	0.6300	0.7000	0.7700	29.2905	(78)

Solar gains	38.5846	65.7319	91.2869	117.5415	137.2730	139.1704	132.9415	117.5016	100.1197	72.8833	46.1847	33.0577	(83)
Total gains	442.8851	478.5888	487.6432	500.4842	502.2670	489.1961	470.5849	456.3047	448.6102	435.4187	429.4998	429.9455	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	15.9499	15.9922	16.0338	16.2322	16.2699	16.4476	16.4476	16.4809	16.3787	16.2699	16.1939	16.1151	
alpha	2.0633	2.0661	2.0689	2.0821	2.0847	2.0965	2.0965	2.0987	2.0919	2.0847	2.0796	2.0743	
util living area	0.8866	0.8650	0.8383	0.7843	0.7030	0.5800	0.4611	0.4866	0.6385	0.7805	0.8559	0.8920	(86)
MIT	18.0140	18.3049	18.7584	19.4174	20.0444	20.5632	20.8095	20.7792	20.4244	19.6576	18.7605	17.9748	(87)
Th 2	19.9015	19.9041	19.9066	19.9185	19.9207	19.9311	19.9311	19.9330	19.9271	19.9207	19.9162	19.9115	(88)
util rest of house	0.8742	0.8503	0.8196	0.7574	0.6616	0.5147	0.3704	0.3979	0.5786	0.7486	0.8380	0.8802	(89)
MIT 2	16.4750	16.8366	17.4022	18.2179	18.9716	19.5653	19.8111	19.7872	19.4193	18.5220	17.4161	16.4297	(90)
Living area fraction										fLA = Living area / (4) =		0.3912	(91)
MIT	17.0772	17.4111	17.9328	18.6872	19.3913	19.9557	20.2017	20.1753	19.8126	18.9663	17.9421	17.0342	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.0772	17.4111	17.9328	18.6872	19.3913	19.9557	20.2017	20.1753	19.8126	18.9663	17.9421	17.0342	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8318	0.8073	0.7776	0.7210	0.6386	0.5163	0.3948	0.4194	0.5714	0.7149	0.7964	0.8386	(94)
Useful gains	368.4121	386.3613	379.2011	360.8625	320.7348	252.5700	185.7831	191.3895	256.3543	311.3005	342.0483	360.5481	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	763.7529	745.8724	679.8177	574.8521	450.7065	310.4503	208.7772	218.3974	332.5278	490.2585	638.3216	759.2960	(97)
Space heating kWh	294.1336	241.5914	223.6587	154.0725	96.6989	0.0000	0.0000	0.0000	0.0000	133.1447	213.3168	296.6684	(98a)

Space heating requirement - total per year (kWh/year) 1653.2851

Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)

Solar heating contribution - total per year (kWh/year) 0.0000

Space heating kWh	294.1336	241.5914	223.6587	154.0725	96.6989	0.0000	0.0000	0.0000	0.0000	133.1447	213.3168	296.6684	(98c)

Space heating requirement after solar contribution - total per year (kWh/year) 1653.2851

Space heating per m2 (98c) / (4) = 33.8303 (99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (201)

Fraction of space heat from main system(s) 1.0000 (202)

Efficiency of main space heating system 1 (in %) 92.3000 (206)

Efficiency of main space heating system 2 (in %) 0.0000 (207)

Efficiency of secondary/supplementary heating system, % 0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	294.1336	241.5914	223.6587	154.0725	96.6989	0.0000	0.0000	0.0000	0.0000	133.1447	213.3168	296.6684	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	318.6713	261.7458	242.3171	166.9258	104.7659	0.0000	0.0000	0.0000	0.0000	144.2522	231.1124	321.4176	(211)

Space heating efficiency (main heating system 2)

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating												
Water heating requirement												
	190.8324	168.8978	179.9059	159.4667	155.4202	140.9706	139.8675	144.9490	146.0012	161.6802	170.5149	188.9325 (64)
Efficiency of water heater												79.8000 (216)
(217)m	85.0266	84.8620	84.5491	83.9827	83.0275	79.8000	79.8000	79.8000	79.8000	83.6277	84.5632	85.0672 (217)
Fuel for water heating, kWh/month												
	224.4385	199.0264	212.7828	189.8805	187.1912	176.6549	175.2725	181.6404	182.9589	193.3333	201.6421	222.0978 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	17.4454	13.9953	12.6012	9.2322	7.1312	5.8263	6.5053	8.4559	10.9834	14.4108	16.2769	17.9302 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-23.3763	-33.2150	-48.1234	-54.5780	-59.2929	-55.5592	-54.9444	-51.7045	-45.9768	-38.2780	-25.8198	-20.1857 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-12.4013	-26.1875	-52.2162	-78.6423	-104.1612	-104.6692	-103.3673	-87.3742	-63.8973	-37.4382	-16.5592	-9.7931 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year	
Space heating fuel - main system 1	1791.2081 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	79.8000
Water heating fuel used	2346.9193 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
Total electricity for the above, kWh/year	86.0000 (231)
Electricity for lighting (calculated in Appendix L)	140.7942 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-1207.7611 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	3157.1605 (238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1791.2081	0.2100	376.1537	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2346.9193	0.2100	492.8531	(264)
Space and water heating			869.0068	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	140.7942	0.1443	20.3210	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-511.0540	0.1344	-68.6798	
PV Unit electricity exported	-696.7070	0.1258	-87.6666	
Total			-156.3465	(269)
Total CO2, kg/year			744.9105	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			15.2400	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1791.2081	1.1300	2024.0651	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2346.9193	1.1300	2652.0188	(278)
Space and water heating			4676.0840	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	140.7942	1.5338	215.9548	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-511.0540	1.4967	-764.8772	
PV Unit electricity exported	-696.7070	0.4619	-321.7956	
Total			-1086.6729	(283)
Total Primary energy kWh/year			3935.4667	(286)
Target Primary Energy Rate (TPER)			80.5300	(287)

Full SAP Calculation Printout

Property Reference	78449-24	**Issued on Date**	03/10/2025
Assessment Reference	001	**Prop Type Ref**	Top Flat / End
Property	2 Shepherd Street, MANCHESTER, M9 4QW		

SAP Rating	81 B	**DER**	5.77	**TER**	15.24
Environmental	96 A	**% DER < TER**			62.14
CO_2 Emissions (t/year)	0.27	**DFEE**	35.82	**TFEE**	41.02
Compliance Check	See BREL	**% DFEE < TFEE**			12.68
% DPER < TPER	25.08	**DPER**	60.34	**TPER**	80.53

Assessor Details	Mr. Daniel Goddard	**Assessor ID**	CP52-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	3.0200 (1b)	x	2.8500 (2b)	=	8.6070	(1b) - (3b)
First floor	45.8500 (1c)	x	2.5200 (2c)	=	115.5420	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	48.8700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	124.1490	(5)

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2. Ventilation rate

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			m3 per hour	
Number of open chimneys		0 * 80 =	0.0000	(6a)
Number of open flues		0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000	(6d)
Number of flues attached to other heater		0 * 35 =	0.0000	(6e)
Number of blocked chimneys		0 * 20 =	0.0000	(6f)
Number of intermittent extract fans		2 * 10 =	20.0000	(7a)
Number of passive vents		0 * 10 =	0.0000	(7b)
Number of flueless gas fires		0 * 40 =	0.0000	(7c)
			Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		20.0000 / (5) =	0.1611	(8)
Pressure test			Yes	
Pressure Test Method			Blower Door	
Measured/design AP50			2.7900	(17)
Infiltration rate			0.3006	(18)
Number of sides sheltered			2	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.2555	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3258	0.3194	0.3130	0.2811	0.2747	0.2427	0.2427	0.2363	0.2555	0.2747	0.2874	0.3002	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0.0000	(23c)

Effective ac	0.5531	0.5510	0.5490	0.5395	0.5377	0.5295	0.5295	0.5279	0.5326	0.5377	0.5413	0.5451	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door			2.1500	0.7800	1.6770			(26)
Window			4.9100	0.7282	3.5752			(27)
GF			3.0200	0.0900	0.2718	75.0000	226.5000	(28a)
Exposed Floor			1.6100	0.1400	0.2254	20.0000	32.2000	(28b)
Main	71.5671	7.0600	64.5071	0.1300	8.3859	9.0000	580.5639	(29a)
PIJ	45.8500		45.8500	0.1100	5.0435	9.0000	412.6500	(30)
Flat	3.0200		3.0200	0.1200	0.3624	9.0000	27.1800	(30)
Total net area of external elements Aum(A, m2)			125.0671					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.5413			(33)
Main dwelling								
Party Wall 1			22.3800	0.0000	0.0000	20.0000	447.6000	(32)
Party Floor 1			37.9700			30.0000	1139.1000	(32d)
Timber			50.4000			9.0000	453.6000	(32c)
Internal Floor 1			6.2700			18.0000	112.8600	(32d)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	3432.2539 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		70.2323 (35)

List of Thermal Bridges

	K1 Element	Length	Psi-value	Total
E2	Other lintels (including other steel lintels)	5.1100	0.1150	0.5877
E3	Sill	5.1100	0.0170	0.0869
E4	Jamb	13.8000	0.0940	1.2972
E5	Ground floor (normal)	3.5100	0.0670	0.2352
E7	Party floor between dwellings (in blocks of flats)	17.0200	0.0320	0.5446
E16	Corner (normal)	20.8200	0.0680	1.4158
E17	Corner (inverted - internal area greater than external area)	5.0400	-0.0290	-0.1462
P1	Party wall - Ground floor	3.5100	0.0560	0.1966
E18	Party wall between dwellings	5.7000	0.2400	1.3680
E25	Staggered party wall between dwellings	5.0400	0.0560	0.2822
E20	Exposed floor (normal)	2.5400	0.3200	0.8128
E21	Exposed floor (inverted)	2.5400	0.3200	0.8128
E6	Intermediate floor within a dwelling	7.4100	0.0320	0.2371
E10	Eaves (insulation at ceiling level)	11.0600	0.0420	0.4645
E12	Gable (insulation at ceiling level)	13.3700	0.0770	1.0295
E14	Flat roof	3.5100	0.2050	0.7195
E24	Eaves (insulation at ceiling level - inverted)	2.0100	0.1500	0.3015
P4	Party wall - Roof (insulation at ceiling level)	4.9100	0.1020	0.5008
P5	Party wall - Roof (insulation at rafter level)	1.5000	0.4800	0.7200

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 11.4665 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 31.0078 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	22.6586	22.5741	22.4914	22.1027	22.0300	21.6915	21.6915	21.6288	21.8219	22.0300	22.1771	22.3309	(38)
Heat transfer coeff	53.6664	53.5819	53.4992	53.1105	53.0378	52.6993	52.6993	52.6366	52.8297	53.0378	53.1849	53.3387	(39)

Average = Sum(39)m / 12 = 53.1102

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0981	1.0964	1.0947	1.0868	1.0853	1.0784	1.0784	1.0771	1.0810	1.0853	1.0883	1.0914	(40)
HLP (average)												1.0868	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.6569 (42)

Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

22.4849	22.1510	21.6808	20.8137	20.1645	19.4446	19.0557	19.5227	20.0311	20.8014	21.6863	22.4089	(42b)

Hot water usage for other uses

31.5982	30.4492	29.3001	28.1511	27.0021	25.8531	25.8531	27.0021	28.1511	29.3001	30.4492	31.5982	(42c)

Average daily hot water use (litres/day) 49.5727 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	54.0831	52.6002	50.9809	48.9648	47.1665	45.2976	44.9088	46.5247	48.1822	50.1015	52.1355	54.0071	(44)
Energy conte	85.6544	74.9019	78.3557	67.0304	63.4952	55.6987	54.3133	57.6074	59.4135	67.9873	74.2766	84.5621	(45)

Energy content (annual) Total = Sum(45)m = 823.2965

Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss:

Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

72.8063	63.6666	66.6024	56.9758	53.9710	47.3439	46.1663	48.9663	50.5015	57.7892	63.1351	71.8778	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

72.8063	63.6666	66.6024	56.9758	53.9710	47.3439	46.1663	48.9663	50.5015	57.7892	63.1351	71.8778	(64)

Total per year (kWh/year) = Sum(64)m = 699.8020 (64)

12Total per year (kWh/year) 700 (64)

Electric shower(s)

41.6433	37.1046	40.5168	38.6647	39.3902	37.5744	38.8269	39.3902	38.6647	40.5168	39.7549	41.6433	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 473.6907 (64a)

Heat gains from water heating, kWh/month

28.6124	25.1928	26.7798	23.9101	23.3403	21.2296	21.2483	22.0891	22.2915	24.5765	25.7225	28.3803	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	86.2814	95.5258	86.2814	89.1574	86.2814	89.1574	86.2814	86.2814	89.1574	86.2814	89.1574	86.2814	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	144.2994	145.7968	142.0235	133.9905	123.8503	114.3199	107.9530	106.4556	110.2290	118.2620	128.4022	137.9326	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	(71)
Water heating gains (Table 5)	38.4575	37.4893	35.9943	33.2085	31.3713	29.4855	28.5595	29.6897	30.9605	33.0329	35.7257	38.1455	(72)
Total internal gains	316.8917	326.6652	312.1525	304.2097	289.3563	280.8162	270.6472	270.2800	278.2002	285.4296	301.1386	310.2128	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a	g Specific data	FF Specific data	Access factor	Gains W

					W/m2	or Table 6b		or Table 6c		Table 6d			
North				2.8600	10.6334	0.3800		0.0000		0.7700		8.8984	(74)
South				2.0500	46.7521	0.3800		0.0000		0.7700		28.0433	(78)
Solar gains	36.9417	62.9330	87.3999	112.5366	131.4279	133.2445	127.2808	112.4984	95.8566	69.7799	44.2182	31.6501	(83)
Total gains	353.8334	389.5982	399.5524	416.7463	420.7842	414.0607	397.9281	382.7784	374.0568	355.2095	345.3568	341.8629	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	17.7654	17.7934	17.8209	17.9513	17.9759	18.0914	18.0914	18.1129	18.0467	17.9759	17.9262	17.8745	
alpha	2.1844	2.1862	2.1881	2.1968	2.1984	2.2061	2.2061	2.2075	2.2031	2.1984	2.1951	2.1916	
util living area	0.9162	0.8952	0.8709	0.8189	0.7400	0.6152	0.4930	0.5227	0.6789	0.8209	0.8901	0.9215	(86)
MIT	18.0272	18.3275	18.7737	19.4262	20.0496	20.5673	20.8128	20.7795	20.4211	19.6412	18.7462	17.9717	(87)
Th 2	20.0023	20.0038	20.0051	20.0117	20.0129	20.0185	20.0185	20.0196	20.0164	20.0129	20.0104	20.0078	(88)
util rest of house	0.9070	0.8838	0.8559	0.7961	0.7032	0.5542	0.4059	0.4378	0.6242	0.7942	0.8763	0.9129	(89)
MIT 2	17.2909	17.5857	18.0247	18.6624	19.2552	19.7246	19.9209	19.8992	19.6024	18.8782	18.0063	17.2400	(90)
Living area fraction									fLA = Living area / (4) =			0.3912	(91)
MIT	17.5790	17.8759	18.3178	18.9612	19.5660	20.0543	20.2698	20.2436	19.9227	19.1768	18.2958	17.5263	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.5790	17.8759	18.3178	18.9612	19.5660	20.0543	20.2698	20.2436	19.9227	19.1768	18.2958	17.5263	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8778	0.8528	0.8245	0.7675	0.6844	0.5566	0.4296	0.4585	0.6184	0.7673	0.8459	0.8845	(94)
Useful gains	310.5797	332.2571	329.4496	319.8445	287.9824	230.4721	170.9404	175.5028	231.3182	272.5464	292.1462	302.3713	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	712.6345	695.2750	632.2404	534.3568	417.1954	287.4385	193.3981	202.3138	307.6102	454.8923	595.4459	710.8061	(97)
Space heating kWh	299.1288	243.9480	225.2763	154.4489	96.1345	0.0000	0.0000	0.0000	0.0000	135.6653	218.3757	303.8755	(98a)
Space heating requirement - total per year (kWh/year)												1676.8530	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	299.1288	243.9480	225.2763	154.4489	96.1345	0.0000	0.0000	0.0000	0.0000	135.6653	218.3757	303.8755	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1676.8530	
Space heating per m2											(98c) / (4) =	34.3125	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	495.3735	389.9749	400.0383	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.6490	0.7182	0.6970	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	321.4914	280.0718	278.8246	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	443.1378	426.3465	410.4093	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	87.5855	108.8283	97.8991	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	21.8964	27.2071	24.4748	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												73.5782	(107)
Energy for space heating												34.3125	(99)
Energy for space cooling												1.5056	(108)
Total												35.8181	(109)
Fabric Energy Efficiency (DFEE)												35.8	(109)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	3.0200	(1b)	x 2.8500	(2b) =	8.6070	(1b) - (3b)
First floor	45.8500	(1c)	x 2.5200	(2c) =	115.5420	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	48.8700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		124.1490	(5)

2. Ventilation rate

m3 per hour

Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1611	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4111	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3494	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4455	0.4368	0.4281	0.3844	0.3756	0.3320	0.3320	0.3232	0.3494	0.3756	0.3931	0.4106	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5992	0.5954	0.5916	0.5739	0.5706	0.5551	0.5551	0.5522	0.5611	0.5706	0.5773	0.5843	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			2.1500	1.0000	2.1500			(26)
TER Opening Type			4.9100	1.1450	5.6221			(27)
GF			3.0200	0.1300	0.3926			(28a)
Exposed Floor			1.6100	0.1300	0.2093			(28b)
Main	71.5671	7.0600	64.5071	0.1800	11.6113			(29a)
PIJ	45.8500		45.8500	0.1100	5.0435			(30)
Flat	3.0200		3.0200	0.1100	0.3322			(30)
Total net area of external elements Aum(A, m2)			125.0671					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		25.3610			(33)
Main dwelling								
Party Wall 1			22.3800	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	70.2323	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	5.1100	0.0500	0.2555
E3 Sill	5.1100	0.0500	0.2555
E4 Jamb	13.8000	0.0500	0.6900
E5 Ground floor (normal)	3.5100	0.1600	0.5616
E7 Party floor between dwellings (in blocks of flats)	17.0200	0.0700	1.1914
E16 Corner (normal)	20.8200	0.0900	1.8738
E17 Corner (inverted - internal area greater than external area)	5.0400	-0.0900	-0.4536
P1 Party wall - Ground floor	3.5100	0.0800	0.2808
E18 Party wall between dwellings	5.7000	0.0600	0.3420
E25 Staggered party wall between dwellings	5.0400	0.0600	0.3024
E20 Exposed floor (normal)	2.5400	0.3200	0.8128
E21 Exposed floor (inverted)	2.5400	0.3200	0.8128
E6 Intermediate floor within a dwelling	7.4100	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	11.0600	0.0600	0.6636
E12 Gable (insulation at ceiling level)	13.3700	0.0600	0.8022
E14 Flat roof	3.5100	0.0800	0.2808
E24 Eaves (insulation at ceiling level - inverted)	2.0100	0.2400	0.4824
P4 Party wall - Roof (insulation at ceiling level)	4.9100	0.1200	0.5892
P5 Party wall - Roof (insulation at rafter level)	1.5000	0.0800	0.1200

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		9.8632	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	35.2242	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	24.5506	24.3928	24.2380	23.5111	23.3751	22.7419	22.7419	22.6247	22.9858	23.3751	23.6502	23.9378	(38)
Heat transfer coeff	59.7749	59.6170	59.4622	58.7353	58.5993	57.9662	57.9662	57.8489	58.2100	58.5993	58.8744	59.1621	(39)
Average = Sum(39)m / 12 =												58.7346	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2231	1.2199	1.2167	1.2019	1.1991	1.1861	1.1861	1.1837	1.1911	1.1991	1.2047	1.2106	(40)
HLP (average)												1.2019	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.6569	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

22.4849	22.1510	21.6808	20.8137	20.1645	19.4446	19.0557	19.5227	20.0311	20.8014	21.6863	22.4089	(42b)

Hot water usage for other uses

31.5982	30.4492	29.3001	28.1511	27.0021	25.8531	25.8531	27.0021	28.1511	29.3001	30.4492	31.5982	(42c)

Average daily hot water use (litres/day)	49.5727	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	54.0831	52.6002	50.9809	48.9648	47.1665	45.2976	44.9088	46.5247	48.1822	50.1015	52.1355	54.0071	(44)
Energy conte	85.6544	74.9019	78.3557	67.0304	63.4952	55.6987	54.3133	57.6074	59.4135	67.9873	74.2766	84.5621	(45)
Energy content (annual)										Total = Sum(45)m =		823.2965	

Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss:
Total storage loss

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

	72.8063	63.6666	66.6024	56.9758	53.9710	47.3439	46.1663	48.9663	50.5015	57.7892	63.1351	71.8778 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)

Output from w/h

	72.8063	63.6666	66.6024	56.9758	53.9710	47.3439	46.1663	48.9663	50.5015	57.7892	63.1351	71.8778 (64)

Total per year (kWh/year) = Sum(64)m = 699.8020 (64)

12Total per year (kWh/year) 700 (64)

Electric shower(s)

	41.6433	37.1046	40.5168	38.6647	39.3902	37.5744	38.8269	39.3902	38.6647	40.5168	39.7549	41.6433 (64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 473.6907 (64a)

Heat gains from water heating, kWh/month

	28.6124	25.1928	26.7798	23.9101	23.3403	21.2296	21.2483	22.0891	22.2915	24.5765	25.7225	28.3803 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	83.9607	92.9565	83.9607	86.7594	83.9607	86.7594	83.9607	83.9607	86.7594	83.9607	86.7594	83.9607 (67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	144.2994	145.7968	142.0235	133.9905	123.8503	114.3199	107.9530	106.4556	110.2290	118.2620	128.4022	137.9326 (68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)

Losses e.g. evaporation (negative values) (Table 5)

	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755 (71)

Water heating gains (Table 5)

	38.4575	37.4893	35.9943	33.2085	31.3713	29.4855	28.5595	29.6897	30.9605	33.0329	35.7257	38.1455 (72)

Total internal gains

	314.5710	324.0959	309.8318	301.8117	287.0356	278.4181	268.3266	267.9593	275.8021	283.1089	298.7406	307.8921 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	2.8600	10.6334	0.6300	0.7000	0.7700	9.2941	(74)
South	2.0500	46.7521	0.6300	0.7000	0.7700	29.2905	(78)

Solar gains	38.5846	65.7319	91.2869	117.5415	137.2730	139.1704	132.9415	117.5016	100.1197	72.8833	46.1847	33.0577 (83)
Total gains	353.1556	389.8278	401.1187	419.3532	424.3086	417.5885	401.2680	385.4609	375.9218	355.9922	344.9253	340.9498 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	15.9499	15.9922	16.0338	16.2322	16.2699	16.4476	16.4476	16.4809	16.3787	16.2699	16.1939	16.1151	
alpha	2.0633	2.0661	2.0689	2.0821	2.0847	2.0965	2.0965	2.0987	2.0919	2.0847	2.0796	2.0743	
util living area													
	0.9210	0.9015	0.8786	0.8299	0.7557	0.6362	0.5169	0.5465	0.6987	0.8325	0.8968	0.9258	(86)
MIT	17.6817	17.9962	18.4798	19.1959	19.8830	20.4728	20.7614	20.7221	20.3055	19.4410	18.4711	17.6385	(87)
Th 2	19.9015	19.9041	19.9066	19.9185	19.9207	19.9311	19.9311	19.9330	19.9271	19.9207	19.9162	19.9115	(88)
util rest of house													
	0.9117	0.8900	0.8634	0.8066	0.7176	0.5712	0.4211	0.4537	0.6412	0.8054	0.8829	0.9171	(89)
MIT 2	16.8908	17.2006	17.6778	18.3819	19.0381	19.5782	19.8104	19.7853	19.4367	18.6286	17.6805	16.8544	(90)

Living area fraction fLA = Living area / (4) = 0.3912 (91)

MIT	17.2003	17.5119	17.9916	18.7004	19.3686	19.9282	20.1825	20.1518	19.7766	18.9464	17.9898	17.1612	(92)

Temperature adjustment 0.0000

adjusted MIT	17.2003	17.5119	17.9916	18.7004	19.3686	19.9282	20.1825	20.1518	19.7766	18.9464	17.9898	17.1612	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8809	0.8570	0.8296	0.7748	0.6950	0.5710	0.4454	0.4744	0.6321	0.7753	0.8506	0.8873	(94)
Useful gains	311.0985	334.0735	332.7651	324.9001	294.8942	238.4611	178.7151	182.8665	237.6034	276.0034	293.3820	302.5237	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	771.1107	751.8811	683.3153	575.6282	449.3770	308.8570	207.6609	217.0384	330.4376	489.0948	641.1319	766.8096	(97)
Space heating kWh													
	342.2491	280.7667	260.8093	180.5243	114.9353	0.0000	0.0000	0.0000	0.0000	158.5400	250.3800	345.4287	(98a)

Space heating requirement - total per year (kWh/year) 1933.6333

Solar heating kWh

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)

Solar heating contribution - total per year (kWh/year) 0.0000

Space heating kWh

	342.2491	280.7667	260.8093	180.5243	114.9353	0.0000	0.0000	0.0000	0.0000	158.5400	250.3800	345.4287	(98c)

Space heating requirement after solar contribution - total per year (kWh/year) 1933.6333

Space heating per m2 (98c) / (4) = 39.5669 (99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	544.8819	428.9496	439.6517	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.6103	0.6800	0.6584	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	332.5665	291.6992	289.4483	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	449.8611	432.7434	415.9721	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	84.4521	104.9369	94.1337	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	21.1130	26.2342	23.5334	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												70.8807	(107)
Energy for space heating												39.5669	(99)
Energy for space cooling												1.4504	(108)
Total												41.0173	(109)
Fabric Energy Efficiency (TFEE)												41.0	(109)

Full SAP Calculation Printout

Property Reference	78449-24	**Issued on Date**	03/10/2025
Assessment Reference	001	**Prop Type Ref**	Top Flat / End
Property	2 Shepherd Street, MANCHESTER, M9 4QW		

SAP Rating	81 B	**DER**	5.77	**TER**	15.24
Environmental	96 A	**% DER < TER**			62.14
CO_2 Emissions (t/year)	0.27	**DFEE**	35.82	**TFEE**	41.02
Compliance Check	See BREL	**% DFEE < TFEE**			12.68
% DPER < TPER	25.08	**DPER**	60.34	**TPER**	80.53

Assessor Details	Mr. Daniel Goddard	**Assessor ID**	CP52-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	3.0200 (1b)	x	2.8500 (2b)	=	8.6070	(1b) - (3b)
First floor	45.8500 (1c)	x	2.5200 (2c)	=	115.5420	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	48.8700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	124.1490	(5)

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2. Ventilation rate

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				m3 per hour
Number of open chimneys			0 * 80 =	0.0000 (6a)
Number of open flues			0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire			0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler			0 * 20 =	0.0000 (6d)
Number of flues attached to other heater			0 * 35 =	0.0000 (6e)
Number of blocked chimneys			0 * 20 =	0.0000 (6f)
Number of intermittent extract fans			0 * 10 =	0.0000 (7a)
Number of passive vents			0 * 10 =	0.0000 (7b)
Number of flueless gas fires			0 * 40 =	0.0000 (7c)
				Air changes per hour
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =			0.0000 / (5) =	0.0000 (8)
Pressure test				Yes
Pressure Test Method				Blower Door
Measured/design AP50				2.7900 (17)
Infiltration rate				0.1395 (18)
Number of sides sheltered				2 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =	0.1186 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1512	0.1482	0.1453	0.1304	0.1275	0.1126	0.1126	0.1097	0.1186	0.1275	0.1334	0.1393	(22b)

Balanced mechanical ventilation with heat recovery		
If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =		80.1000 (23c)

Effective ac	0.2507	0.2477	0.2448	0.2299	0.2270	0.2121	0.2121	0.2092	0.2181	0.2270	0.2329	0.2388	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door			2.1500	0.7800	1.6770			(26)
Window			4.9100	0.7282	3.5752			(27)
GF			3.0200	0.0900	0.2718	75.0000	226.5000	(28a)
Exposed Floor			1.6100	0.1400	0.2254	20.0000	32.2000	(28b)
Main	71.5671	7.0600	64.5071	0.1300	8.3859	9.0000	580.5639	(29a)
PIJ	45.8500		45.8500	0.1100	5.0435	9.0000	412.6500	(30)
Flat	3.0200		3.0200	0.1200	0.3624	9.0000	27.1800	(30)
Total net area of external elements Aum(A, m2)			125.0671					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.5413			(33)
Main dwelling								
Party Wall 1			22.3800	0.0000	0.0000	20.0000	447.6000	(32)
Party Floor 1			37.9700			30.0000	1139.1000	(32d)
Timber			50.4000			9.0000	453.6000	(32c)
Internal Floor 1			6.2700			18.0000	112.8600	(32d)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 3432.2539 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 70.2323 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	5.1100	0.1150	0.5877
E3 Sill	5.1100	0.0170	0.0869
E4 Jamb	13.8000	0.0940	1.2972
E5 Ground floor (normal)	3.5100	0.0670	0.2352
E7 Party floor between dwellings (in blocks of flats)	17.0200	0.0320	0.5446
E16 Corner (normal)	20.8200	0.0680	1.4158
E17 Corner (inverted - internal area greater than external area)	5.0400	-0.0290	-0.1462
P1 Party wall - Ground floor	3.5100	0.0560	0.1966
E18 Party wall between dwellings	5.7000	0.2400	1.3680
E25 Staggered party wall between dwellings	5.0400	0.0560	0.2822
E20 Exposed floor (normal)	2.5400	0.3200	0.8128
E21 Exposed floor (inverted)	2.5400	0.3200	0.8128
E6 Intermediate floor within a dwelling	7.4100	0.0320	0.2371
E10 Eaves (insulation at ceiling level)	11.0600	0.0420	0.4645
E12 Gable (insulation at ceiling level)	13.3700	0.0770	1.0295
E14 Flat roof	3.5100	0.2050	0.7195
E24 Eaves (insulation at ceiling level - inverted)	2.0100	0.1500	0.3015
P4 Party wall - Roof (insulation at ceiling level)	4.9100	0.1020	0.5008
P5 Party wall - Roof (insulation at rafter level)	1.5000	0.4800	0.7200

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 11.4665 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 31.0078 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	10.2703	10.1488	10.0274	9.4201	9.2987	8.6915	8.6915	8.5700	8.9344	9.2987	9.5416	9.7845	(38)
Heat transfer coeff	41.2781	41.1566	41.0352	40.4279	40.3065	39.6993	39.6993	39.5778	39.9421	40.3065	40.5494	40.7923	(39)

Average = Sum(39)m / 12 = 40.3976

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8447	0.8422	0.8397	0.8273	0.8248	0.8123	0.8123	0.8099	0.8173	0.8248	0.8297	0.8347	(40)
HLP (average)												0.8266	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.6569 (42)
Hot water usage for mixer showers

52.0000	51.2186	50.0798	47.9010	46.2932	44.5001	43.4809	44.6110	45.8498	47.7751	50.0006	51.8008	(42a)

Hot water usage for baths

22.4849	22.1510	21.6808	20.8137	20.1645	19.4446	19.0557	19.5227	20.0311	20.8014	21.6863	22.4089	(42b)

Hot water usage for other uses

31.5982	30.4492	29.3001	28.1511	27.0021	25.8531	25.8531	27.0021	28.1511	29.3001	30.4492	31.5982	(42c)

Average daily hot water use (litres/day) 97.5150 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	106.0831	103.8187	101.0607	96.8659	93.4597	89.7977	88.3896	91.1358	94.0320	97.8766	102.1361	105.8079	(44)
Energy conte	168.0098	147.8365	155.3265	132.6045	125.8147	110.4167	106.8996	112.8451	115.9509	132.8176	145.5116	165.6696	(45)
Energy content (annual)										Total = Sum(45)m =		1619.7032	
Distribution loss (46)m = 0.15 x (45)m	25.2015	22.1755	23.2990	19.8907	18.8722	16.5625	16.0349	16.9268	17.3926	19.9226	21.8267	24.8504	(46)
Water storage loss:													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8694	(55)
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	194.9612	172.1797	182.2779	158.6865	152.7661	136.4987	133.8510	139.7965	142.0329	159.7690	171.5936	192.6210	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	194.9612	172.1797	182.2779	158.6865	152.7661	136.4987	133.8510	139.7965	142.0329	159.7690	171.5936	192.6210	(64)
										Total per year (kWh/year) = Sum(64)m =		1937.0342	(64)
12Total per year (kWh/year)												1937	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	55.8632	49.1556	51.6461	44.0910	41.8334	36.7136	35.5441	37.5210	38.5537	44.1619	48.3826	55.0851	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	86.2814	95.5258	86.2814	89.1574	86.2814	89.1574	86.2814	86.2814	89.1574	86.2814	89.1574	86.2814	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	144.2994	145.7968	142.0235	133.9905	123.8503	114.3199	107.9530	106.4556	110.2290	118.2620	128.4022	137.9326	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	(71)
Water heating gains (Table 5)	75.0850	73.1483	69.4168	61.2375	56.2277	50.9911	47.7744	50.4314	53.5468	59.3573	67.1981	74.0392	(72)
Total internal gains	353.5191	362.3242	345.5749	332.2387	314.2126	302.3217	289.8621	291.0218	300.7865	311.7540	332.6110	346.1064	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	2.8600	10.6334	0.3800	0.0000	0.7700	8.8984	(74)
South	2.0500	46.7521	0.3800	0.0000	0.7700	28.0433	(78)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	36.9417	62.9330	87.3999	112.5366	131.4279	133.2445	127.2808	112.4984	95.8566	69.7799	44.2182	31.6501	(83)
Total gains	390.4608	425.2572	432.9748	444.7753	445.6406	435.5662	417.1429	403.5201	396.6431	381.5339	376.8292	377.7566	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	23.0971	23.1653	23.2338	23.5828	23.6539	24.0157	24.0157	24.0894	23.8696	23.6539	23.5122	23.3722	
alpha	2.5398	2.5444	2.5489	2.5722	2.5769	2.6010	2.6010	2.6060	2.5913	2.5769	2.5675	2.5581	
util living area	0.8819	0.8537	0.8209	0.7534	0.6557	0.5135	0.3923	0.4182	0.5817	0.7534	0.8453	0.8889	(86)
MIT	18.9869	19.2500	19.5988	20.0933	20.5131	20.8197	20.9346	20.9210	20.7346	20.2239	19.5595	18.9506	(87)
Th 2	20.2148	20.2169	20.2191	20.2298	20.2319	20.2426	20.2426	20.2448	20.2384	20.2319	20.2276	20.2234	(88)
util rest of house	0.8714	0.8411	0.8049	0.7306	0.6222	0.4655	0.3319	0.3580	0.5356	0.7267	0.8302	0.8790	(89)
MIT 2	17.8437	18.1727	18.6095	19.2247	19.7282	20.0811	20.1959	20.1862	19.9900	19.3929	18.5723	17.8039	(90)
Living area fraction										fLA = Living area / (4) =		0.3912	(91)
MIT	18.2909	18.5941	18.9965	19.5645	20.0353	20.3701	20.4849	20.4737	20.2813	19.7180	18.9585	18.2525	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.2909	18.5941	18.9965	19.5645	20.0353	20.3701	20.4849	20.4737	20.2813	19.7180	18.9585	18.2525	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8401	0.8102	0.7760	0.7088	0.6130	0.4739	0.3517	0.3768	0.5383	0.7068	0.8008	0.8483	(94)
Useful gains	328.0445	344.5250	335.9849	315.2410	273.1857	206.4160	146.7132	152.0270	213.5278	269.6747	301.7798	320.4341	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	577.5194	563.6047	512.7981	431.1451	335.9667	229.0680	154.2290	161.2276	246.8948	367.5155	480.8562	573.2355	(97)
Space heating kWh	185.6093	147.2215	131.5490	83.4509	46.7091	0.0000	0.0000	0.0000	0.0000	72.7935	128.9350	188.0842	(98a)
Space heating requirement - total per year (kWh/year)												984.3526	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	185.6093	147.2215	131.5490	83.4509	46.7091	0.0000	0.0000	0.0000	0.0000	72.7935	128.9350	188.0842	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												984.3526	
Space heating per m2										(98c) / (4) =		20.1423	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Fraction of main heating from main system 2	0.0000 (203)
Fraction of total heating from main system 1	1.0000 (204)
Fraction of total heating from main system 2	0.0000 (205)
Efficiency of main space heating system 1 (in %)	100.0000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	185.6093	147.2215	131.5490	83.4509	46.7091	0.0000	0.0000	0.0000	0.0000	72.7935	128.9350	188.0842	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	185.6093	147.2215	131.5490	83.4509	46.7091	0.0000	0.0000	0.0000	0.0000	72.7935	128.9350	188.0842	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	194.9612	172.1797	182.2779	158.6865	152.7661	136.4987	133.8510	139.7965	142.0329	159.7690	171.5936	192.6210	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month	60.0768	53.0567	56.1685	48.8988	47.0745	42.0617	41.2458	43.0779	43.7671	49.2324	52.8761	59.3557	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	15.6682	14.1519	15.6682	15.1628	15.6682	15.1628	15.6682	15.6682	15.1628	15.6682	15.1628	15.6682	(231)
Lighting	17.2805	13.8631	12.4822	9.1450	7.0638	5.7712	6.4439	8.3760	10.8796	14.2746	16.1231	17.7608	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	984.3526	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	324.5200	
Water heating fuel used	596.8921	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.2180)		
mechanical ventilation fans (SFP = 1.2180)	184.4804	(230a)
Total electricity for the above, kWh/year	184.4804	(231)
Electricity for lighting (calculated in Appendix L)	139.4638	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	1905.1890	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	984.3526	0.1545	152.0627	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	596.8921	0.1411	84.2266	(264)
Space and water heating			236.2893	(265)
Pumps, fans and electric keep-hot	184.4804	0.1387	25.5897	(267)
Energy for lighting	139.4638	0.1443	20.1289	(268)
Total CO2, kg/year			282.0079	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			5.7700	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	984.3526	1.5719	1547.3245	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	596.8921	1.5218	908.3378	(278)
Space and water heating			2455.6622	(279)
Pumps, fans and electric keep-hot	184.4804	1.5128	279.0820	(281)
Energy for lighting	139.4638	1.5338	213.9142	(282)
Total Primary energy kWh/year			2948.6585	(286)
Dwelling Primary energy Rate (DPER)			60.3400	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)		
Main dwelling							
Ground floor	3.0200	(1b)	x 2.8500	(2b)	= 8.6070	(1b) - (3b)	
First floor	45.8500	(1c)	x 2.5200	(2c)	= 115.5420	(1c) - (3c)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	48.8700					(4)	
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)		= 124.1490	(5)	

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2. Ventilation rate

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	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1611	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4111	(18)

Number of sides sheltered 2 (19)

Shelter factor (20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.3494 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4455	0.4368	0.4281	0.3844	0.3756	0.3320	0.3320	0.3232	0.3494	0.3756	0.3931	0.4106	(22b)
Effective ac	0.5992	0.5954	0.5916	0.5739	0.5706	0.5551	0.5551	0.5522	0.5611	0.5706	0.5773	0.5843	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			2.1500	1.0000	2.1500			(26)
TER Opening Type			4.9100	1.1450	5.6221			(27)
GF			3.0200	0.1300	0.3926			(28a)
Exposed Floor			1.6100	0.1300	0.2093			(28b)
Main	71.5671	7.0600	64.5071	0.1800	11.6113			(29a)
PIJ	45.8500		45.8500	0.1100	5.0435			(30)
Flat	3.0200		3.0200	0.1100	0.3322			(30)
Total net area of external elements Aum(A, m2)			125.0671					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		25.3610			(33)
Main dwelling								
Party Wall 1			22.3800	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 70.2323 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	5.1100	0.0500	0.2555
E3 Sill	5.1100	0.0500	0.2555
E4 Jamb	13.8000	0.0500	0.6900
E5 Ground floor (normal)	3.5100	0.1600	0.5616
E7 Party floor between dwellings (in blocks of flats)	17.0200	0.0700	1.1914
E16 Corner (normal)	20.8200	0.0900	1.8738
E17 Corner (inverted - internal area greater than external area)	5.0400	-0.0900	-0.4536
P1 Party wall - Ground floor	3.5100	0.0800	0.2808
E18 Party wall between dwellings	5.7000	0.0600	0.3420
E25 Staggered party wall between dwellings	5.0400	0.0600	0.3024
E20 Exposed floor (normal)	2.5400	0.3200	0.8128
E21 Exposed floor (inverted)	2.5400	0.3200	0.8128
E6 Intermediate floor within a dwelling	7.4100	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	11.0600	0.0600	0.6636
E12 Gable (insulation at ceiling level)	13.3700	0.0600	0.8022
E14 Flat roof	3.5100	0.0800	0.2808
E24 Eaves (insulation at ceiling level - inverted)	2.0100	0.2400	0.4824
P4 Party wall - Roof (insulation at ceiling level)	4.9100	0.1200	0.5892
P5 Party wall - Roof (insulation at rafter level)	1.5000	0.0800	0.1200

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.8632 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 35.2242 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	24.5506	24.3928	24.2380	23.5111	23.3751	22.7419	22.7419	22.6247	22.9858	23.3751	23.6502	23.9378	(38)
Heat transfer coeff	59.7749	59.6170	59.4622	58.7353	58.5993	57.9662	57.9662	57.8489	58.2100	58.5993	58.8744	59.1621	(39)
Average = Sum(39)m / 12 =												58.7346	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2231	1.2199	1.2167	1.2019	1.1991	1.1861	1.1861	1.1837	1.1911	1.1991	1.2047	1.2106	(40)
HLP (average)												1.2019	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.6569 (42)
Hot water usage for mixer showers

52.0000	51.2186	50.0798	47.9010	46.2932	44.5001	43.4809	44.6110	45.8498	47.7751	50.0006	51.8008	(42a)

Hot water usage for baths

22.4849	22.1510	21.6808	20.8137	20.1645	19.4446	19.0557	19.5227	20.0311	20.8014	21.6863	22.4089	(42b)

Hot water usage for other uses

31.5982	30.4492	29.3001	28.1511	27.0021	25.8531	25.8531	27.0021	28.1511	29.3001	30.4492	31.5982	(42c)

Average daily hot water use (litres/day) 97.5150 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	106.0831	103.8187	101.0607	96.8659	93.4597	89.7977	88.3896	91.1358	94.0320	97.8766	102.1361	105.8079	(44)
Energy conte	168.0098	147.8365	155.3265	132.6045	125.8147	110.4167	106.8996	112.8451	115.9509	132.8176	145.5116	165.6696	(45)
Energy content (annual)										Total = Sum(45)m =		1619.7032	
Distribution loss (46)m = 0.15 x (45)m	25.2015	22.1755	23.2990	19.8907	18.8722	16.5625	16.0349	16.9268	17.3926	19.9226	21.8267	24.8504	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	214.6047	189.9222	201.9214	177.6964	172.4096	155.5086	153.4945	159.4400	161.0427	179.4125	190.6035	212.2645	(62)
WWHRS	-23.7722	-21.0244	-22.0155	-18.2297	-16.9894	-14.5380	-13.6270	-14.4910	-15.0415	-17.7323	-20.0886	-23.3320	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	190.8324	168.8978	179.9059	159.4667	155.4202	140.9706	139.8675	144.9490	146.0012	161.6802	170.5149	188.9325	(64)

Total per year (kWh/year) = Sum(64)m = 1947.4390 (64)

12Total per year (kWh/year) 1947 (64)

Electric shower(s)

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

	93.1392	82.8242	88.9220	80.1645	79.1093	72.7870	72.8200	74.7969	74.6271	81.4378	84.4561	92.3611 (65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	82.8443	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	83.9607	92.9565	83.9607	86.7594	83.9607	86.7594	83.9607	83.9607	86.7594	83.9607	86.7594	83.9607	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	144.2994	145.7968	142.0235	133.9905	123.8503	114.3199	107.9530	106.4556	110.2290	118.2620	128.4022	137.9326	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	31.2844	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	(71)

Water heating gains (Table 5)

	125.1871	123.2503	119.5188	111.3395	106.3297	101.0931	97.8764	100.5335	103.6488	109.4594	117.3001	124.1412	(72)

Total internal gains

	404.3005	412.8569	396.3563	382.9427	364.9940	350.0257	337.6434	338.8031	348.4905	362.5354	383.3150	396.8878	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	2.8600	10.6334	0.6300	0.7000	0.7700	9.2941	(74)
South	2.0500	46.7521	0.6300	0.7000	0.7700	29.2905	(78)

Solar gains	38.5846	65.7319	91.2869	117.5415	137.2730	139.1704	132.9415	117.5016	100.1197	72.8833	46.1847	33.0577	(83)
Total gains	442.8851	478.5888	487.6432	500.4842	502.2670	489.1961	470.5849	456.3047	448.6102	435.4187	429.4998	429.9455	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	15.9499	15.9922	16.0338	16.2322	16.2699	16.4476	16.4476	16.4809	16.3787	16.2699	16.1939	16.1151	
alpha	2.0633	2.0661	2.0689	2.0821	2.0847	2.0965	2.0965	2.0987	2.0919	2.0847	2.0796	2.0743	
util living area	0.8866	0.8650	0.8383	0.7843	0.7030	0.5800	0.4611	0.4866	0.6385	0.7805	0.8559	0.8920	(86)
MIT	18.0140	18.3049	18.7584	19.4174	20.0444	20.5632	20.8095	20.7792	20.4244	19.6576	18.7605	17.9748	(87)
Th 2	19.9015	19.9041	19.9066	19.9185	19.9207	19.9311	19.9311	19.9330	19.9271	19.9207	19.9162	19.9115	(88)
util rest of house	0.8742	0.8503	0.8196	0.7574	0.6616	0.5147	0.3704	0.3979	0.5786	0.7486	0.8380	0.8802	(89)
MIT 2	16.4750	16.8366	17.4022	18.2179	18.9716	19.5653	19.8111	19.7872	19.4193	18.5220	17.4161	16.4297	(90)
Living area fraction										fLA = Living area / (4) =		0.3912	(91)
MIT	17.0772	17.4111	17.9328	18.6872	19.3913	19.9557	20.2017	20.1753	19.8126	18.9663	17.9421	17.0342	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.0772	17.4111	17.9328	18.6872	19.3913	19.9557	20.2017	20.1753	19.8126	18.9663	17.9421	17.0342	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8318	0.8073	0.7776	0.7210	0.6386	0.5163	0.3948	0.4194	0.5714	0.7149	0.7964	0.8386	(94)
Useful gains	368.4121	386.3613	379.2011	360.8625	320.7348	252.5700	185.7831	191.3895	256.3543	311.3005	342.0483	360.5481	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	763.7529	745.8724	679.8177	574.8521	450.7065	310.4503	208.7772	218.3974	332.5278	490.2585	638.3216	759.2960	(97)
Space heating kWh	294.1336	241.5914	223.6587	154.0725	96.6989	0.0000	0.0000	0.0000	0.0000	133.1447	213.3168	296.6684	(98a)

Space heating requirement - total per year (kWh/year) 1653.2851

Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)

Solar heating contribution - total per year (kWh/year) 0.0000

Space heating kWh	294.1336	241.5914	223.6587	154.0725	96.6989	0.0000	0.0000	0.0000	0.0000	133.1447	213.3168	296.6684	(98c)

Space heating requirement after solar contribution - total per year (kWh/year) 1653.2851

Space heating per m2 (98c) / (4) = 33.8303 (99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (201)

Fraction of space heat from main system(s) 1.0000 (202)

Efficiency of main space heating system 1 (in %) 92.3000 (206)

Efficiency of main space heating system 2 (in %) 0.0000 (207)

Efficiency of secondary/supplementary heating system, % 0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	294.1336	241.5914	223.6587	154.0725	96.6989	0.0000	0.0000	0.0000	0.0000	133.1447	213.3168	296.6684	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	318.6713	261.7458	242.3171	166.9258	104.7659	0.0000	0.0000	0.0000	0.0000	144.2522	231.1124	321.4176	(211)

Space heating efficiency (main heating system 2)

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating												
Water heating requirement												
	190.8324	168.8978	179.9059	159.4667	155.4202	140.9706	139.8675	144.9490	146.0012	161.6802	170.5149	188.9325 (64)
Efficiency of water heater												79.8000 (216)
(217)m	85.0266	84.8620	84.5491	83.9827	83.0275	79.8000	79.8000	79.8000	79.8000	83.6277	84.5632	85.0672 (217)
Fuel for water heating, kWh/month												
	224.4385	199.0264	212.7828	189.8805	187.1912	176.6549	175.2725	181.6404	182.9589	193.3333	201.6421	222.0978 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	17.4454	13.9953	12.6012	9.2322	7.1312	5.8263	6.5053	8.4559	10.9834	14.4108	16.2769	17.9302 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-23.3763	-33.2150	-48.1234	-54.5780	-59.2929	-55.5592	-54.9444	-51.7045	-45.9768	-38.2780	-25.8198	-20.1857 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-12.4013	-26.1875	-52.2162	-78.6423	-104.1612	-104.6692	-103.3673	-87.3742	-63.8973	-37.4382	-16.5592	-9.7931 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year	
Space heating fuel - main system 1	1791.2081 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	79.8000
Water heating fuel used	2346.9193 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
Total electricity for the above, kWh/year	86.0000 (231)
Electricity for lighting (calculated in Appendix L)	140.7942 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-1207.7611 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	3157.1605 (238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1791.2081	0.2100	376.1537	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2346.9193	0.2100	492.8531	(264)
Space and water heating			869.0068	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	140.7942	0.1443	20.3210	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-511.0540	0.1344	-68.6798	
PV Unit electricity exported	-696.7070	0.1258	-87.6666	
Total			-156.3465	(269)
Total CO2, kg/year			744.9105	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			15.2400	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1791.2081	1.1300	2024.0651	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2346.9193	1.1300	2652.0188	(278)
Space and water heating			4676.0840	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	140.7942	1.5338	215.9548	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-511.0540	1.4967	-764.8772	
PV Unit electricity exported	-696.7070	0.4619	-321.7956	
Total			-1086.6729	(283)
Total Primary energy kWh/year			3935.4667	(286)
Target Primary Energy Rate (TPER)			80.5300	(287)

Full SAP Calculation Printout

Property Reference	78449-24	**Issued on Date**	03/10/2025
Assessment Reference	001	**Prop Type Ref**	Top Flat / End
Property	2 Shepherd Street, MANCHESTER, M9 4QW		

SAP Rating	81 B	**DER**	5.77	**TER**	15.24
Environmental	96 A	**% DER < TER**			62.14
CO_2 Emissions (t/year)	0.27	**DFEE**	35.82	**TFEE**	41.02
Compliance Check	See BREL	**% DFEE < TFEE**			12.68
% DPER < TPER	25.08	**DPER**	60.34	**TPER**	80.53

Assessor Details	Mr. Daniel Goddard	**Assessor ID**	CP52-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	3.0200 (1b)	x	2.8500 (2b)	=	8.6070	(1b) - (3b)
First floor	45.8500 (1c)	x	2.5200 (2c)	=	115.5420	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	48.8700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	124.1490	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.7900	(17)
Infiltration rate		0.1395	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1186	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1512	0.1482	0.1453	0.1304	0.1275	0.1126	0.1126	0.1097	0.1186	0.1275	0.1334	0.1393	(22b)

Balanced mechanical ventilation with heat recovery		
If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	80.1000	(23c)

Effective ac	0.2507	0.2477	0.2448	0.2299	0.2270	0.2121	0.2121	0.2092	0.2181	0.2270	0.2329	0.2388	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door			2.1500	0.7800	1.6770			(26)
Window			4.9100	0.7282	3.5752			(27)
GF			3.0200	0.0900	0.2718	75.0000	226.5000	(28a)
Exposed Floor			1.6100	0.1400	0.2254	20.0000	32.2000	(28b)
Main	71.5671	7.0600	64.5071	0.1300	8.3859	9.0000	580.5639	(29a)
PIJ	45.8500		45.8500	0.1100	5.0435	9.0000	412.6500	(30)
Flat	3.0200		3.0200	0.1200	0.3624	9.0000	27.1800	(30)
Total net area of external elements Aum(A, m2)			125.0671					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.5413			(33)
Main dwelling								
Party Wall 1			22.3800	0.0000	0.0000	20.0000	447.6000	(32)
Party Floor 1			37.9700			30.0000	1139.1000	(32d)
Timber			50.4000			9.0000	453.6000	(32c)
Internal Floor 1			6.2700			18.0000	112.8600	(32d)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 3432.2539 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 70.2323 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	5.1100	0.1150	0.5877
E3 Sill	5.1100	0.0170	0.0869
E4 Jamb	13.8000	0.0940	1.2972
E5 Ground floor (normal)	3.5100	0.0670	0.2352
E7 Party floor between dwellings (in blocks of flats)	17.0200	0.0320	0.5446
E16 Corner (normal)	20.8200	0.0680	1.4158
E17 Corner (inverted - internal area greater than external area)	5.0400	-0.0290	-0.1462
P1 Party wall - Ground floor	3.5100	0.0560	0.1966
E18 Party wall between dwellings	5.7000	0.2400	1.3680
E25 Staggered party wall between dwellings	5.0400	0.0560	0.2822
E20 Exposed floor (normal)	2.5400	0.3200	0.8128
E21 Exposed floor (inverted)	2.5400	0.3200	0.8128
E6 Intermediate floor within a dwelling	7.4100	0.0320	0.2371
E10 Eaves (insulation at ceiling level)	11.0600	0.0420	0.4645
E12 Gable (insulation at ceiling level)	13.3700	0.0770	1.0295
E14 Flat roof	3.5100	0.2050	0.7195
E24 Eaves (insulation at ceiling level - inverted)	2.0100	0.1500	0.3015
P4 Party wall - Roof (insulation at ceiling level)	4.9100	0.1020	0.5008
P5 Party wall - Roof (insulation at rafter level)	1.5000	0.4800	0.7200

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 11.4665 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 31.0078 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	10.2703	10.1488	10.0274	9.4201	9.2987	8.6915	8.6915	8.5700	8.9344	9.2987	9.5416	9.7845	(38)
Heat transfer coeff	41.2781	41.1566	41.0352	40.4279	40.3065	39.6993	39.6993	39.5778	39.9421	40.3065	40.5494	40.7923	(39)

Average = Sum(39)m / 12 = 40.3976

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8447	0.8422	0.8397	0.8273	0.8248	0.8123	0.8123	0.8099	0.8173	0.8248	0.8297	0.8347	(40)
HLP (average)												0.8266	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.6569 (42)
Hot water usage for mixer showers

52.0000	51.2186	50.0798	47.9010	46.2932	44.5001	43.4809	44.6110	45.8498	47.7751	50.0006	51.8008	(42a)

Hot water usage for baths

22.4849	22.1510	21.6808	20.8137	20.1645	19.4446	19.0557	19.5227	20.0311	20.8014	21.6863	22.4089	(42b)

Hot water usage for other uses

31.5982	30.4492	29.3001	28.1511	27.0021	25.8531	25.8531	27.0021	28.1511	29.3001	30.4492	31.5982	(42c)

Average daily hot water use (litres/day) 97.5150 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	106.0831	103.8187	101.0607	96.8659	93.4597	89.7977	88.3896	91.1358	94.0320	97.8766	102.1361	105.8079	(44)
Energy conte	168.0098	147.8365	155.3265	132.6045	125.8147	110.4167	106.8996	112.8451	115.9509	132.8176	145.5116	165.6696	(45)
Energy content (annual)										Total = Sum(45)m =		1619.7032	
Distribution loss (46)m = 0.15 x (45)m	25.2015	22.1755	23.2990	19.8907	18.8722	16.5625	16.0349	16.9268	17.3926	19.9226	21.8267	24.8504	(46)
Water storage loss:													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8694	(55)
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	194.9612	172.1797	182.2779	158.6865	152.7661	136.4987	133.8510	139.7965	142.0329	159.7690	171.5936	192.6210	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	194.9612	172.1797	182.2779	158.6865	152.7661	136.4987	133.8510	139.7965	142.0329	159.7690	171.5936	192.6210	(64)
										Total per year (kWh/year) = Sum(64)m =		1937.0342	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	55.8632	49.1556	51.6461	44.0910	41.8334	36.7136	35.5441	37.5210	38.5537	44.1619	48.3826	55.0851	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	99.4132	99.4132	99.4132	99.4132	99.4132	99.4132	99.4132	99.4132	99.4132	99.4132	99.4132	99.4132	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	19.7425	17.5352	14.2605	10.7962	8.0702	6.8132	7.3620	9.5693	12.8440	16.3083	19.0342	20.2913	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	215.3723	217.6072	211.9753	199.9858	184.8511	170.6267	161.1239	158.8890	164.5209	176.5104	191.6451	205.8695	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	46.5982	46.5982	46.5982	46.5982	46.5982	46.5982	46.5982	46.5982	46.5982	46.5982	46.5982	46.5982	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	(71)
Water heating gains (Table 5)	75.0850	73.1483	69.4168	61.2375	56.2277	50.9911	47.7744	50.4314	53.5468	59.3573	67.1981	74.0392	(72)
Total internal gains	389.9358	388.0265	375.3886	351.7554	328.8850	308.1670	295.9962	298.6258	310.6475	331.9121	357.6133	379.9359	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	2.8600	10.6334	0.3800	0.0000	0.7700	8.8984	(74)
South	2.0500	46.7521	0.3800	0.0000	0.7700	28.0433	(78)

Solar gains	36.9417	62.9330	87.3999	112.5366	131.4279	133.2445	127.2808	112.4984	95.8566	69.7799	44.2182	31.6501	(83)
Total gains	426.8775	450.9595	462.7885	464.2920	460.3129	441.4115	423.2770	411.1241	406.5041	401.6920	401.8315	411.5860	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	23.0971	23.1653	23.2338	23.5828	23.6539	24.0157	24.0157	24.0894	23.8696	23.6539	23.5122	23.3722	
alpha	2.5398	2.5444	2.5489	2.5722	2.5769	2.6010	2.6010	2.6060	2.5913	2.5769	2.5675	2.5581	
util living area	0.8620	0.8388	0.8016	0.7386	0.6432	0.5083	0.3874	0.4116	0.5720	0.7356	0.8282	0.8705	(86)
MIT	19.1247	19.3388	19.6895	20.1394	20.5358	20.8240	20.9365	20.9239	20.7452	20.2712	19.6433	19.0826	(87)
Th 2	20.2148	20.2169	20.2191	20.2298	20.2319	20.2426	20.2426	20.2448	20.2384	20.2319	20.2276	20.2234	(88)
util rest of house	0.8503	0.8253	0.7845	0.7152	0.6094	0.4606	0.3276	0.3521	0.5260	0.7080	0.8120	0.8595	(89)
MIT 2	18.0138	18.2814	18.7187	19.2784	19.7529	20.0852	20.1974	20.1885	20.0005	19.4471	18.6737	17.9672	(90)
Living area fraction										fLA = Living area / (4) =		0.3912	(91)
MIT	18.4484	18.6951	19.0985	19.6152	20.0592	20.3742	20.4866	20.4762	20.2918	19.7695	19.0531	18.4036	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.4484	18.6951	19.0985	19.6152	20.0592	20.3742	20.4866	20.4762	20.2918	19.7695	19.0531	18.4036	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8189	0.7948	0.7568	0.6947	0.6014	0.4692	0.3473	0.3708	0.5294	0.6898	0.7834	0.8284	(94)
Useful gains	349.5769	358.4224	350.2183	322.5311	276.8308	207.0989	146.9977	152.4606	215.2039	277.0942	314.7886	340.9672	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	584.0203	567.7595	516.9829	433.1949	336.9314	229.2328	154.2939	161.3273	247.3155	369.5909	484.6890	579.3970	(97)
Space heating kWh	174.4259	140.6745	124.0728	79.6779	44.7148	0.0000	0.0000	0.0000	0.0000	68.8175	122.3283	177.3918	(98a)
Space heating requirement - total per year (kWh/year)												932.1036	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	174.4259	140.6745	124.0728	79.6779	44.7148	0.0000	0.0000	0.0000	0.0000	68.8175	122.3283	177.3918	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												932.1036	
Space heating per m2										(98c) / (4) =		19.0731	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Fraction of main heating from main system 2	0.0000 (203)
Fraction of total heating from main system 1	1.0000 (204)
Fraction of total heating from main system 2	0.0000 (205)
Efficiency of main space heating system 1 (in %)	100.0000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	174.4259	140.6745	124.0728	79.6779	44.7148	0.0000	0.0000	0.0000	0.0000	68.8175	122.3283	177.3918	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	174.4259	140.6745	124.0728	79.6779	44.7148	0.0000	0.0000	0.0000	0.0000	68.8175	122.3283	177.3918	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	194.9612	172.1797	182.2779	158.6865	152.7661	136.4987	133.8510	139.7965	142.0329	159.7690	171.5936	192.6210	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month	60.0768	53.0567	56.1685	48.8988	47.0745	42.0617	41.2458	43.0779	43.7671	49.2324	52.8761	59.3557	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	15.6682	14.1519	15.6682	15.1628	15.6682	15.1628	15.6682	15.6682	15.1628	15.6682	15.1628	15.6682	(231)
Lighting	17.2805	13.8631	12.4822	9.1450	7.0638	5.7712	6.4439	8.3760	10.8796	14.2746	16.1231	17.7608	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													

(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	932.1036	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	324.5200	
Water heating fuel used	596.8921	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.2180)		
mechanical ventilation fans (SFP = 1.2180)	184.4804	(230a)
Total electricity for the above, kWh/year	184.4804	(231)
Electricity for lighting (calculated in Appendix L)	139.4638	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	1852.9400	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	932.1036	16.4900	153.7039	(240)
Space heating - main system 2	0.0000	16.4900	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	596.8921	16.4900	98.4275	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	184.4804	16.4900	30.4208	(249)
Energy for lighting	139.4638	16.4900	22.9976	(250)
Additional standing charges			0.0000	(251)
Total energy cost			305.5498	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.1718	(257)
SAP value		81.0049	
SAP rating (Section 12)		81	(258)
SAP band		B	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	932.1036	0.1545	143.9644	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	596.8921	0.1411	84.2266	(264)
Space and water heating			228.1910	(265)
Pumps, fans and electric keep-hot	184.4804	0.1387	25.5897	(267)
Energy for lighting	139.4638	0.1443	20.1289	(268)
Total CO2, kg/year			273.9097	(272)
CO2 emissions per m2			5.6000	(273)
EI value			96.0899	
EI rating			96	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	3.0200	(1b) x	2.8500	(2b) =	8.6070	(1b) - (3b)
First floor	45.8500	(1c) x	2.5200	(2c) =	115.5420	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 48.8700						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		124.1490	(5)

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2. Ventilation rate

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	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)

Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		2.7900 (17)
Infiltration rate		0.1395 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1186 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.6000	4.5000	4.5000	4.1000	4.2000	3.7000	3.5000	3.5000	3.7000	4.1000	4.1000	4.2000	(22)
Wind factor	1.1500	1.1250	1.1250	1.0250	1.0500	0.9250	0.8750	0.8750	0.9250	1.0250	1.0250	1.0500	(22a)
Adj infilt rate	0.1364	0.1334	0.1334	0.1215	0.1245	0.1097	0.1038	0.1038	0.1097	0.1215	0.1215	0.1245	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =		80.1000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2359	0.2329	0.2329	0.2210	0.2240	0.2092	0.2033	0.2033	0.2092	0.2210	0.2210	0.2240	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Door			2.1500	0.7800	1.6770			(26)
Window			4.9100	0.7282	3.5752			(27)
GF			3.0200	0.0900	0.2718	75.0000	226.5000	(28a)
Exposed Floor			1.6100	0.1400	0.2254	20.0000	32.2000	(28b)
Main	71.5671	7.0600	64.5071	0.1300	8.3859	9.0000	580.5639	(29a)
PIJ	45.8500		45.8500	0.1100	5.0435	9.0000	412.6500	(30)
Flat	3.0200		3.0200	0.1200	0.3624	9.0000	27.1800	(30)
Total net area of external elements Aum(A, m2)			125.0671					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.5413			(33)
Main dwelling								
Party Wall 1			22.3800	0.0000	0.0000	20.0000	447.6000	(32)
Party Floor 1			37.9700			30.0000	1139.1000	(32d)
Timber			50.4000			9.0000	453.6000	(32c)
Internal Floor 1			6.2700			18.0000	112.8600	(32d)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	3432.2539 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		70.2323 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	5.1100	0.1150	0.5877
E3 Sill	5.1100	0.0170	0.0869
E4 Jamb	13.8000	0.0940	1.2972
E5 Ground floor (normal)	3.5100	0.0670	0.2352
E7 Party floor between dwellings (in blocks of flats)	17.0200	0.0320	0.5446
E16 Corner (normal)	20.8200	0.0680	1.4158
E17 Corner (inverted - internal area greater than external area)	5.0400	-0.0290	-0.1462
P1 Party wall - Ground floor	3.5100	0.0560	0.1966
E18 Party wall between dwellings	5.7000	0.2400	1.3680
E25 Staggered party wall between dwellings	5.0400	0.0560	0.2822
E20 Exposed floor (normal)	2.5400	0.3200	0.8128
E21 Exposed floor (inverted)	2.5400	0.3200	0.8128
E6 Intermediate floor within a dwelling	7.4100	0.0320	0.2371
E10 Eaves (insulation at ceiling level)	11.0600	0.0420	0.4645
E12 Gable (insulation at ceiling level)	13.3700	0.0770	1.0295
E14 Flat roof	3.5100	0.2050	0.7195
E24 Eaves (insulation at ceiling level - inverted)	2.0100	0.1500	0.3015
P4 Party wall - Roof (insulation at ceiling level)	4.9100	0.1020	0.5008
P5 Party wall - Roof (insulation at rafter level)	1.5000	0.4800	0.7200

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		11.4665 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	31.0078 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	9.6630	9.5416	9.5416	9.0558	9.1772	8.5700	8.3271	8.3271	8.5700	9.0558	9.0558	9.1772	(38)
Heat transfer coeff	40.6708	40.5494	40.5494	40.0636	40.1850	39.5778	39.3349	39.3349	39.5778	40.0636	40.0636	40.1850	(39)
Average = Sum(39)m / 12 =												40.0130	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8322	0.8297	0.8297	0.8198	0.8223	0.8099	0.8049	0.8049	0.8099	0.8198	0.8198	0.8223	(40)
HLP (average)												0.8188	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		1.6569 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
52.0000	51.2186	50.0798	47.9010	46.2932	44.5001	43.4809	44.6110	45.8498	47.7751	50.0006	51.8008	(42a)

Hot water usage for baths

22.4849	22.1510	21.6808	20.8137	20.1645	19.4446	19.0557	19.5227	20.0311	20.8014	21.6863	22.4089	(42b)

Hot water usage for other uses

31.5982	30.4492	29.3001	28.1511	27.0021	25.8531	25.8531	27.0021	28.1511	29.3001	30.4492	31.5982	(42c)

Average daily hot water use (litres/day)	97.5150 (43)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use												
106.0831	103.8187	101.0607	96.8659	93.4597	89.7977	88.3896	91.1358	94.0320	97.8766	102.1361	105.8079	(44)

Energy conte	168.0098	147.8365	155.3265	132.6045	125.8147	110.4167	106.8996	112.8451	115.9509	132.8176	145.5116	165.6696	(45)
Energy content (annual)										Total = Sum(45)m =		1619.7032	
Distribution loss (46)m = 0.15 x (45)m													
	25.2015	22.1755	23.2990	19.8907	18.8722	16.5625	16.0349	16.9268	17.3926	19.9226	21.8267	24.8504	(46)
Water storage loss:													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8694	(55)
Total storage loss													
	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage													
	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	194.9612	172.1797	182.2779	158.6865	152.7661	136.4987	133.8510	139.7965	142.0329	159.7690	171.5936	192.6210	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	194.9612	172.1797	182.2779	158.6865	152.7661	136.4987	133.8510	139.7965	142.0329	159.7690	171.5936	192.6210	(64)
										Total per year (kWh/year) = Sum(64)m =		1937.0342	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
					Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =							0.0000	(64a)
Heat gains from water heating, kWh/month													
	55.8632	49.1556	51.6461	44.0910	41.8334	36.7136	35.5441	37.5210	38.5537	44.1619	48.3826	55.0851	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	99.4132	99.4132	99.4132	99.4132	99.4132	99.4132	99.4132	99.4132	99.4132	99.4132	99.4132	99.4132	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	19.7425	17.5352	14.2605	10.7962	8.0702	6.8132	7.3620	9.5693	12.8440	16.3083	19.0342	20.2913	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	215.3723	217.6072	211.9753	199.9858	184.8511	170.6267	161.1239	158.8890	164.5209	176.5104	191.6451	205.8695	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	46.5982	46.5982	46.5982	46.5982	46.5982	46.5982	46.5982	46.5982	46.5982	46.5982	46.5982	46.5982	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	(71)
Water heating gains (Table 5)													
	75.0850	73.1483	69.4168	61.2375	56.2277	50.9911	47.7744	50.4314	53.5468	59.3573	67.1981	74.0392	(72)
Total internal gains													
	389.9358	388.0265	375.3886	351.7554	328.8850	308.1670	295.9962	298.6258	310.6475	331.9121	357.6133	379.9359	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	2.8600	8.9975	0.3800	0.0000	0.7700	7.5294	(74)
South	2.0500	39.5594	0.3800	0.0000	0.7700	23.7289	(78)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	31.2584	55.9404	81.9374	107.2849	122.5292	126.5823	118.5261	103.1832	90.8554	64.4936	38.8584	28.6358	(83)
Total gains	421.1942	443.9670	457.3260	459.0403	451.4142	434.7493	414.5222	401.8090	401.5029	396.4056	396.4717	408.5717	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	23.4420	23.5122	23.5122	23.7973	23.7253	24.0894	24.2381	24.2381	24.0894	23.7973	23.7973	23.7253	
alpha	2.5628	2.5675	2.5675	2.5865	2.5817	2.6060	2.6159	2.6159	2.6060	2.5865	2.5865	2.5817	
util living area													
	0.8577	0.8342	0.7989	0.7287	0.6239	0.4884	0.3917	0.4101	0.5740	0.7321	0.8220	0.8650	(86)
MIT	19.2291	19.4351	19.7393	20.2071	20.5990	20.8509	20.9362	20.9272	20.7471	20.3004	19.7304	19.1973	(87)
Th 2	20.2255	20.2276	20.2276	20.2362	20.2341	20.2448	20.2491	20.2491	20.2448	20.2362	20.2362	20.2341	(88)
util rest of house													
	0.8455	0.8203	0.7816	0.7042	0.5876	0.4384	0.3318	0.3497	0.5284	0.7039	0.8050	0.8535	(89)
MIT 2	18.1518	18.4090	18.7865	19.3654	19.8285	20.1155	20.2034	20.1959	20.0083	19.4857	18.7879	18.1181	(90)
Living area fraction									fLA = Living area / (4) =			0.3912	(91)
MIT	18.5733	18.8105	19.1593	19.6947	20.1300	20.4032	20.4901	20.4820	20.2973	19.8044	19.1567	18.5403	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.5733	18.8105	19.1593	19.6947	20.1300	20.4032	20.4901	20.4820	20.2973	19.8044	19.1567	18.5403	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8148	0.7905	0.7545	0.6852	0.5824	0.4492	0.3515	0.3689	0.5317	0.6864	0.7773	0.8230	(94)
Useful gains	343.1995	350.9748	345.0622	314.5507	262.8964	195.3085	145.6979	148.2239	213.4772	272.0967	308.1964	336.2675	(95)
Ext temp.	4.7000	5.3000	6.7000	9.3000	12.3000	15.0000	16.6000	16.5000	14.1000	10.8000	7.5000	4.6000	(96)
Heat loss rate W													
	564.2369	547.8415	505.2154	416.4506	314.6473	213.8470	153.0176	156.6328	245.2775	360.7504	467.0087	560.1930	(97)
Space heating kWh													
	164.4518	132.2944	119.1540	73.3680	38.5027	0.0000	0.0000	0.0000	0.0000	65.9583	114.3449	166.6006	(98a)
Space heating requirement - total per year (kWh/year)												874.6747	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	164.4518	132.2944	119.1540	73.3680	38.5027	0.0000	0.0000	0.0000	0.0000	65.9583	114.3449	166.6006	(98c)

Space heating requirement after solar contribution - total per year (kWh/year) 874.6747
Space heating per m2 (98c) / (4) = 17.8980 (99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (201)
Fraction of space heat from main system(s) 1.0000 (202)
Fraction of main heating from main system 2 0.0000 (203)
Fraction of total heating from main system 1 1.0000 (204)
Fraction of total heating from main system 2 0.0000 (205)
Efficiency of main space heating system 1 (in %) 100.0000 (206)
Efficiency of main space heating system 2 (in %) 0.0000 (207)
Efficiency of secondary/supplementary heating system, % 0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	164.4518	132.2944	119.1540	73.3680	38.5027	0.0000	0.0000	0.0000	0.0000	65.9583	114.3449	166.6006	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	164.4518	132.2944	119.1540	73.3680	38.5027	0.0000	0.0000	0.0000	0.0000	65.9583	114.3449	166.6006	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	194.9612	172.1797	182.2779	158.6865	152.7661	136.4987	133.8510	139.7965	142.0329	159.7690	171.5936	192.6210	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month	60.0768	53.0567	56.1685	48.8988	47.0745	42.0617	41.2458	43.0779	43.7671	49.2324	52.8761	59.3557	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	15.6682	14.1519	15.6682	15.1628	15.6682	15.1628	15.6682	15.6682	15.1628	15.6682	15.1628	15.6682	(231)
Lighting	17.2805	13.8631	12.4822	9.1450	7.0638	5.7712	6.4439	8.3760	10.8796	14.2746	16.1231	17.7608	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year
Space heating fuel - main system 1 874.6747 (211)
Space heating fuel - main system 2 0.0000 (213)
Space heating fuel - secondary 0.0000 (215)
Efficiency of water heater 324.5200
Water heating fuel used 596.8921 (219)
Space cooling fuel 0.0000 (221)

Electricity for pumps and fans:
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.2180)
mechanical ventilation fans (SFP = 1.2180) 184.4804 (230a)
Total electricity for the above, kWh/year 184.4804 (231)
Electricity for lighting (calculated in Appendix L) 139.4638 (232)

Energy saving/generation technologies (Appendices M ,N and Q)
PV generation 0.0000 (233)
Wind generation 0.0000 (234)
Hydro-electric generation (Appendix N) 0.0000 (235a)
Electricity generated - Micro CHP (Appendix N) 0.0000 (235)
Appendix Q - special features
Energy saved or generated -0.0000 (236)
Energy used 0.0000 (237)
Total delivered energy for all uses 1795.5111 (238)

10a. Fuel costs - using BEDF prices (583)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	874.6747	28.4300	248.6700	(240)
Space heating - main system 2	0.0000	28.4300	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	596.8921	28.4300	169.6964	(247)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(247a)
Pumps, fans and electric keep-hot	184.4804	28.4300	52.4478	(249)
Energy for lighting	139.4638	28.4300	39.6496	(250)
Additional standing charges			0.0000	(251)
Total energy cost			510.4638	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	874.6747	0.1545	135.1696	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	596.8921	0.1411	84.2266	(264)

Space and water heating			219.3962 (265)
Pumps, fans and electric keep-hot	184.4804	0.1387	25.5897 (267)
Energy for lighting	139.4638	0.1443	20.1289 (268)
Total CO2, kg/year			265.1149 (272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	874.6747	1.5721	1375.1148	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	596.8921	1.5218	908.3378	(278)
Space and water heating			2283.4526	(279)
Pumps, fans and electric keep-hot	184.4804	1.5128	279.0820	(281)
Energy for lighting	139.4638	1.5338	213.9142	(282)
Total Primary energy kWh/year			2776.4488	(286)

SAP 10 EPC IMPROVEMENTS

001

Current energy efficiency rating: B 81
Current environmental impact rating: A 96

N	Solar water heating		Not applicable
U	Solar photovoltaic panels		Not applicable
V2	Wind turbine		Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
(none)			

	Typical annual savings	Energy efficiency	Environmental impact
Recommended measures			
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: B 81
Potential environmental impact rating: A 96

Fuel prices for cost data on this page from database revision number 583 TEST (01 Oct 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, West Pennines (England)):

	Current	Potential	Saving
Electricity	£510	£510	£0
Space heating	£301	£301	£0
Water heating	£170	£170	£0
Lighting	£40	£40	£0
Total cost of fuels	£510	£510	£0
Total cost of uses	£511	£511	£0
Delivered energy	37 kWh/m²	37 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.3 tonnes	0.3 tonnes	0.0 tonnes
CO2 emissions per m²	5 kg/m²	5 kg/m²	0 kg/m²
Primary energy	57 kWh/m²	57 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	3.0200 (1b)	x	2.8500 (2b)	=	8.6070	(1b) - (3b)
First floor	45.8500 (1c)	x	2.5200 (2c)	=	115.5420	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	48.8700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	124.1490	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.7900	(17)
Infiltration rate		0.1395	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1186	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													
	0.1512	0.1482	0.1453	0.1304	0.1275	0.1126	0.1126	0.1097	0.1186	0.1275	0.1334	0.1393	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	80.1000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2507	0.2477	0.2448	0.2299	0.2270	0.2121	0.2121	0.2092	0.2181	0.2270	0.2329	0.2388	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Door			2.1500	0.7800	1.6770			(26)
Window			4.9100	0.7282	3.5752			(27)
GF			3.0200	0.0900	0.2718	75.0000	226.5000	(28a)
Exposed Floor			1.6100	0.1400	0.2254	20.0000	32.2000	(28b)
Main	71.5671	7.0600	64.5071	0.1300	8.3859	9.0000	580.5639	(29a)
PIJ	45.8500		45.8500	0.1100	5.0435	9.0000	412.6500	(30)
Flat	3.0200		3.0200	0.1200	0.3624	9.0000	27.1800	(30)
Total net area of external elements Aum(A, m2)			125.0671					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.5413			(33)
Main dwelling								
Party Wall 1			22.3800	0.0000	0.0000	20.0000	447.6000	(32)
Party Floor 1			37.9700			30.0000	1139.1000	(32d)
Timber			50.4000			9.0000	453.6000	(32c)
Internal Floor 1			6.2700			18.0000	112.8600	(32d)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 3432.2539	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	70.2323	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	5.1100	0.1150	0.5877
E3 Sill	5.1100	0.0170	0.0869
E4 Jamb	13.8000	0.0940	1.2972
E5 Ground floor (normal)	3.5100	0.0670	0.2352
E7 Party floor between dwellings (in blocks of flats)	17.0200	0.0320	0.5446
E16 Corner (normal)	20.8200	0.0680	1.4158
E17 Corner (inverted - internal area greater than external area)	5.0400	-0.0290	-0.1462
P1 Party wall - Ground floor	3.5100	0.0560	0.1966
E18 Party wall between dwellings	5.7000	0.2400	1.3680
E25 Staggered party wall between dwellings	5.0400	0.0560	0.2822
E20 Exposed floor (normal)	2.5400	0.3200	0.8128
E21 Exposed floor (inverted)	2.5400	0.3200	0.8128
E6 Intermediate floor within a dwelling	7.4100	0.0320	0.2371
E10 Eaves (insulation at ceiling level)	11.0600	0.0420	0.4645
E12 Gable (insulation at ceiling level)	13.3700	0.0770	1.0295
E14 Flat roof	3.5100	0.2050	0.7195
E24 Eaves (insulation at ceiling level - inverted)	2.0100	0.1500	0.3015
P4 Party wall - Roof (insulation at ceiling level)	4.9100	0.1020	0.5008
P5 Party wall - Roof (insulation at rafter level)	1.5000	0.4800	0.7200

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	11.4665	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	31.0078	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	10.2703	10.1488	10.0274	9.4201	9.2987	8.6915	8.6915	8.5700	8.9344	9.2987	9.5416	9.7845	(38)
Heat transfer coeff													
	41.2781	41.1566	41.0352	40.4279	40.3065	39.6993	39.6993	39.5778	39.9421	40.3065	40.5494	40.7923	(39)
Average = Sum(39)m / 12 =												40.3976	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8447	0.8422	0.8397	0.8273	0.8248	0.8123	0.8123	0.8099	0.8173	0.8248	0.8297	0.8347	(40)
HLP (average)												0.8266	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.6569	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
52.0000	51.2186	50.0798	47.9010	46.2932	44.5001	43.4809	44.6110	45.8498	47.7751	50.0006	51.8008	(42a)

Hot water usage for baths

22.4849	22.1510	21.6808	20.8137	20.1645	19.4446	19.0557	19.5227	20.0311	20.8014	21.6863	22.4089	(42b)

Hot water usage for other uses

31.5982	30.4492	29.3001	28.1511	27.0021	25.8531	25.8531	27.0021	28.1511	29.3001	30.4492	31.5982	(42c)

Average daily hot water use (litres/day)	97.5150 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	106.0831	103.8187	101.0607	96.8659	93.4597	89.7977	88.3896	91.1358	94.0320	97.8766	102.1361	105.8079	(44)
Energy conte	168.0098	147.8365	155.3265	132.6045	125.8147	110.4167	106.8996	112.8451	115.9509	132.8176	145.5116	165.6696	(45)
Energy content (annual)										Total = Sum(45)m =		1619.7032	
Distribution loss (46)m = 0.15 x (45)m													
	25.2015	22.1755	23.2990	19.8907	18.8722	16.5625	16.0349	16.9268	17.3926	19.9226	21.8267	24.8504	(46)

Water storage loss:	
Store volume	200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):	1.6100 (48)

Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8694	(55)
Total storage loss													
	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage													
	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	194.9612	172.1797	182.2779	158.6865	152.7661	136.4987	133.8510	139.7965	142.0329	159.7690	171.5936	192.6210	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	194.9612	172.1797	182.2779	158.6865	152.7661	136.4987	133.8510	139.7965	142.0329	159.7690	171.5936	192.6210	(64)
									Total per year (kWh/year) = Sum(64)m =			1937.0342	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Heat gains from water heating, kWh/month													
	55.8632	49.1556	51.6461	44.0910	41.8334	36.7136	35.5441	37.5210	38.5537	44.1619	48.3826	55.0851	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	99.4132	99.4132	99.4132	99.4132	99.4132	99.4132	99.4132	99.4132	99.4132	99.4132	99.4132	99.4132	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	19.7425	17.5352	14.2605	10.7962	8.0702	6.8132	7.3620	9.5693	12.8440	16.3083	19.0342	20.2913	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	215.3723	217.6072	211.9753	199.9858	184.8511	170.6267	161.1239	158.8890	164.5209	176.5104	191.6451	205.8695	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	46.5982	46.5982	46.5982	46.5982	46.5982	46.5982	46.5982	46.5982	46.5982	46.5982	46.5982	46.5982	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	(71)
Water heating gains (Table 5)													
	75.0850	73.1483	69.4168	61.2375	56.2277	50.9911	47.7744	50.4314	53.5468	59.3573	67.1981	74.0392	(72)
Total internal gains													
	389.9358	388.0265	375.3886	351.7554	328.8850	308.1670	295.9962	298.6258	310.6475	331.9121	357.6133	379.9359	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	2.8600	10.6334	0.3800	0.0000	0.7700	8.8984	(74)
South	2.0500	46.7521	0.3800	0.0000	0.7700	28.0433	(78)

Solar gains	36.9417	62.9330	87.3999	112.5366	131.4279	133.2445	127.2808	112.4984	95.8566	69.7799	44.2182	31.6501	(83)
Total gains	426.8775	450.9595	462.7885	464.2920	460.3129	441.4115	423.2770	411.1241	406.5041	401.6920	401.8315	411.5860	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	23.0971	23.1653	23.2338	23.5828	23.6539	24.0157	24.0157	24.0894	23.8696	23.6539	23.5122	23.3722	
alpha	2.5398	2.5444	2.5489	2.5722	2.5769	2.6010	2.6010	2.6060	2.5913	2.5769	2.5675	2.5581	
util living area													
	0.8620	0.8388	0.8016	0.7386	0.6432	0.5083	0.3874	0.4116	0.5720	0.7356	0.8282	0.8705	(86)
MIT	19.1247	19.3388	19.6895	20.1394	20.5358	20.8240	20.9365	20.9239	20.7452	20.2712	19.6433	19.0826	(87)
Th 2	20.2148	20.2169	20.2191	20.2298	20.2319	20.2426	20.2426	20.2448	20.2384	20.2319	20.2276	20.2234	(88)
util rest of house													
	0.8503	0.8253	0.7845	0.7152	0.6094	0.4606	0.3276	0.3521	0.5260	0.7080	0.8120	0.8595	(89)
MIT 2	18.0138	18.2814	18.7187	19.2784	19.7529	20.0852	20.1974	20.1885	20.0005	19.4471	18.6737	17.9672	(90)
Living area fraction										fLA = Living area / (4) =		0.3912	(91)
MIT	18.4484	18.6951	19.0985	19.6152	20.0592	20.3742	20.4866	20.4762	20.2918	19.7695	19.0531	18.4036	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.4484	18.6951	19.0985	19.6152	20.0592	20.3742	20.4866	20.4762	20.2918	19.7695	19.0531	18.4036	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8189	0.7948	0.7568	0.6947	0.6014	0.4692	0.3473	0.3708	0.5294	0.6898	0.7834	0.8284	(94)
Useful gains	349.5769	358.4224	350.2183	322.5311	276.8308	207.0989	146.9977	152.4606	215.2039	277.0942	314.7886	340.9672	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	584.0203	567.7595	516.9829	433.1949	336.9314	229.2328	154.2939	161.3273	247.3155	369.5909	484.6890	579.3970	(97)
Space heating kWh													
	174.4259	140.6745	124.0728	79.6779	44.7148	0.0000	0.0000	0.0000	0.0000	68.8175	122.3283	177.3918	(98a)
Space heating requirement - total per year (kWh/year)												932.1036	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	174.4259	140.6745	124.0728	79.6779	44.7148	0.0000	0.0000	0.0000	0.0000	68.8175	122.3283	177.3918	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												932.1036	
Space heating per m2											(98c) / (4) =	19.0731	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Fraction of main heating from main system 2												0.0000	(203)
Fraction of total heating from main system 1												1.0000	(204)
Fraction of total heating from main system 2												0.0000	(205)
Efficiency of main space heating system 1 (in %)												100.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	174.4259	140.6745	124.0728	79.6779	44.7148	0.0000	0.0000	0.0000	0.0000	68.8175	122.3283	177.3918	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	174.4259	140.6745	124.0728	79.6779	44.7148	0.0000	0.0000	0.0000	0.0000	68.8175	122.3283	177.3918	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement													
	194.9612	172.1797	182.2779	158.6865	152.7661	136.4987	133.8510	139.7965	142.0329	159.7690	171.5936	192.6210	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month													
	60.0768	53.0567	56.1685	48.8988	47.0745	42.0617	41.2458	43.0779	43.7671	49.2324	52.8761	59.3557	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	15.6682	14.1519	15.6682	15.1628	15.6682	15.1628	15.6682	15.6682	15.1628	15.6682	15.1628	15.6682	(231)
Lighting	17.2805	13.8631	12.4822	9.1450	7.0638	5.7712	6.4439	8.3760	10.8796	14.2746	16.1231	17.7608	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												932.1036	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												324.5200	
Water heating fuel used												596.8921	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.2180)													
mechanical ventilation fans (SFP = 1.2180)												184.4804	(230a)
Total electricity for the above, kWh/year												184.4804	(231)
Electricity for lighting (calculated in Appendix L)												139.4638	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												1852.9400	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	932.1036	16.4900	153.7039	(240)
Space heating - main system 2	0.0000	16.4900	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	596.8921	16.4900	98.4275	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	184.4804	16.4900	30.4208	(249)
Energy for lighting	139.4638	16.4900	22.9976	(250)
Additional standing charges			0.0000	(251)
Total energy cost			305.5498	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.1718	(257)
SAP value		81.0049	
SAP rating (Section 12)		81	(258)
SAP band		B	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	

Space heating - main system 1	932.1036	0.1545	143.9644	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	596.8921	0.1411	84.2266	(264)
Space and water heating			228.1910	(265)
Pumps, fans and electric keep-hot	184.4804	0.1387	25.5897	(267)
Energy for lighting	139.4638	0.1443	20.1289	(268)
Total CO2, kg/year			273.9097	(272)
CO2 emissions per m2			5.6000	(273)
EI value			96.0899	
EI rating			96	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	3.0200	(1b) x	2.8500	(2b) =	8.6070	(1b) - (3b)
First floor	45.8500	(1c) x	2.5200	(2c) =	115.5420	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	48.8700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		124.1490	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.7900	(17)
Infiltration rate		0.1395	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1186	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.6000	4.5000	4.5000	4.1000	4.2000	3.7000	3.5000	3.5000	3.7000	4.1000	4.1000	4.2000	(22)
Wind factor	1.1500	1.1250	1.1250	1.0250	1.0500	0.9250	0.8750	0.8750	0.9250	1.0250	1.0250	1.0500	(22a)
Adj infilt rate	0.1364	0.1334	0.1334	0.1215	0.1245	0.1097	0.1038	0.1038	0.1097	0.1215	0.1215	0.1245	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	80.1000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2359	0.2329	0.2329	0.2210	0.2240	0.2092	0.2033	0.2033	0.2092	0.2210	0.2210	0.2240	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door			2.1500	0.7800	1.6770			(26)
Window			4.9100	0.7282	3.5752			(27)
GF			3.0200	0.0900	0.2718	75.0000	226.5000	(28a)
Exposed Floor			1.6100	0.1400	0.2254	20.0000	32.2000	(28b)
Main	71.5671	7.0600	64.5071	0.1300	8.3859	9.0000	580.5639	(29a)
PIJ	45.8500		45.8500	0.1100	5.0435	9.0000	412.6500	(30)
Flat	3.0200		3.0200	0.1200	0.3624	9.0000	27.1800	(30)
Total net area of external elements Aum(A, m2)			125.0671					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.5413			(33)
Main dwelling								
Party Wall 1			22.3800	0.0000	0.0000	20.0000	447.6000	(32)
Party Floor 1			37.9700			30.0000	1139.1000	(32d)
Timber			50.4000			9.0000	453.6000	(32c)
Internal Floor 1			6.2700			18.0000	112.8600	(32d)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 3432.2539	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	70.2323	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	5.1100	0.1150	0.5877
E3 Sill	5.1100	0.0170	0.0869
E4 Jamb	13.8000	0.0940	1.2972
E5 Ground floor (normal)	3.5100	0.0670	0.2352
E7 Party floor between dwellings (in blocks of flats)	17.0200	0.0320	0.5446
E16 Corner (normal)	20.8200	0.0680	1.4158

E17 Corner (inverted - internal area greater than external area)	5.0400	-0.0290	-0.1462
P1 Party wall - Ground floor	3.5100	0.0560	0.1966
E18 Party wall between dwellings	5.7000	0.2400	1.3680
E25 Staggered party wall between dwellings	5.0400	0.0560	0.2822
E20 Exposed floor (normal)	2.5400	0.3200	0.8128
E21 Exposed floor (inverted)	2.5400	0.3200	0.8128
E6 Intermediate floor within a dwelling	7.4100	0.0320	0.2371
E10 Eaves (insulation at ceiling level)	11.0600	0.0420	0.4645
E12 Gable (insulation at ceiling level)	13.3700	0.0770	1.0295
E14 Flat roof	3.5100	0.2050	0.7195
E24 Eaves (insulation at ceiling level - inverted)	2.0100	0.1500	0.3015
P4 Party wall - Roof (insulation at ceiling level)	4.9100	0.1020	0.5008
P5 Party wall - Roof (insulation at rafter level)	1.5000	0.4800	0.7200

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 11.4665 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 31.0078 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	9.6630	9.5416	9.5416	9.0558	9.1772	8.5700	8.3271	8.3271	8.5700	9.0558	9.0558	9.1772	(38)
Heat transfer coeff	40.6708	40.5494	40.5494	40.0636	40.1850	39.5778	39.3349	39.3349	39.5778	40.0636	40.0636	40.1850	(39)

Average = Sum(39)m / 12 = 40.0130

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8322	0.8297	0.8297	0.8198	0.8223	0.8099	0.8049	0.8049	0.8099	0.8198	0.8198	0.8223	(40)
HLP (average)												0.8188	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.6569 (42)

Hot water usage for mixer showers

52.0000	51.2186	50.0798	47.9010	46.2932	44.5001	43.4809	44.6110	45.8498	47.7751	50.0006	51.8008	(42a)

Hot water usage for baths

22.4849	22.1510	21.6808	20.8137	20.1645	19.4446	19.0557	19.5227	20.0311	20.8014	21.6863	22.4089	(42b)

Hot water usage for other uses

31.5982	30.4492	29.3001	28.1511	27.0021	25.8531	25.8531	27.0021	28.1511	29.3001	30.4492	31.5982	(42c)

Average daily hot water use (litres/day) 97.5150 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	106.0831	103.8187	101.0607	96.8659	93.4597	89.7977	88.3896	91.1358	94.0320	97.8766	102.1361	105.8079	(44)
Energy conte	168.0098	147.8365	155.3265	132.6045	125.8147	110.4167	106.8996	112.8451	115.9509	132.8176	145.5116	165.6696	(45)
Energy content (annual)										Total = Sum(45)m =		1619.7032	

Distribution loss (46)m = 0.15 x (45)m

25.2015	22.1755	23.2990	19.8907	18.8722	16.5625	16.0349	16.9268	17.3926	19.9226	21.8267	24.8504	(46)

Water storage loss:
Store volume 200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.6100 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.8694 (55)
Total storage loss

26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)

If cylinder contains dedicated solar storage

26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Primary loss
Combi loss

Total heat required for water heating calculated for each month

194.9612	172.1797	182.2779	158.6865	152.7661	136.4987	133.8510	139.7965	142.0329	159.7690	171.5936	192.6210	(62)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

WWHRS
PV diverter
Solar input
FGHRS

Output from w/h

194.9612	172.1797	182.2779	158.6865	152.7661	136.4987	133.8510	139.7965	142.0329	159.7690	171.5936	192.6210	(64)

Total per year (kWh/year) = Sum(64)m = 1937.0342 (64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

55.8632	49.1556	51.6461	44.0910	41.8334	36.7136	35.5441	37.5210	38.5537	44.1619	48.3826	55.0851	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	99.4132	99.4132	99.4132	99.4132	99.4132	99.4132	99.4132	99.4132	99.4132	99.4132	99.4132	99.4132	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	19.7425	17.5352	14.2605	10.7962	8.0702	6.8132	7.3620	9.5693	12.8440	16.3083	19.0342	20.2913	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	215.3723	217.6072	211.9753	199.9858	184.8511	170.6267	161.1239	158.8890	164.5209	176.5104	191.6451	205.8695	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	46.5982	46.5982	46.5982	46.5982	46.5982	46.5982	46.5982	46.5982	46.5982	46.5982	46.5982	46.5982	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	-66.2755	(71)
Water heating gains (Table 5)	75.0850	73.1483	69.4168	61.2375	56.2277	50.9911	47.7744	50.4314	53.5468	59.3573	67.1981	74.0392	(72)
Total internal gains	389.9358	388.0265	375.3886	351.7554	328.8850	308.1670	295.9962	298.6258	310.6475	331.9121	357.6133	379.9359	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	2.8600	8.9975	0.3800	0.0000	0.7700	7.5294	(74)
South	2.0500	39.5594	0.3800	0.0000	0.7700	23.7289	(78)

Solar gains	31.2584	55.9404	81.9374	107.2849	122.5292	126.5823	118.5261	103.1832	90.8554	64.4936	38.8584	28.6358	(83)
Total gains	421.1942	443.9670	457.3260	459.0403	451.4142	434.7493	414.5222	401.8090	401.5029	396.4056	396.4717	408.5717	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	23.4420	23.5122	23.5122	23.7973	23.7253	24.0894	24.2381	24.2381	24.0894	23.7973	23.7973	23.7253	
alpha	2.5628	2.5675	2.5675	2.5865	2.5817	2.6060	2.6159	2.6159	2.6060	2.5865	2.5865	2.5817	
util living area	0.8577	0.8342	0.7989	0.7287	0.6239	0.4884	0.3917	0.4101	0.5740	0.7321	0.8220	0.8650	(86)
MIT	19.2291	19.4351	19.7393	20.2071	20.5990	20.8509	20.9362	20.9272	20.7471	20.3004	19.7304	19.1973	(87)
Th 2	20.2255	20.2276	20.2276	20.2362	20.2341	20.2448	20.2491	20.2491	20.2448	20.2362	20.2362	20.2341	(88)
util rest of house	0.8455	0.8203	0.7816	0.7042	0.5876	0.4384	0.3318	0.3497	0.5284	0.7039	0.8050	0.8535	(89)
MIT 2	18.1518	18.4090	18.7865	19.3654	19.8285	20.1155	20.2034	20.1959	20.0083	19.4857	18.7879	18.1181	(90)
Living area fraction									fLA = Living area / (4) =			0.3912	(91)
MIT	18.5733	18.8105	19.1593	19.6947	20.1300	20.4032	20.4901	20.4820	20.2973	19.8044	19.1567	18.5403	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.5733	18.8105	19.1593	19.6947	20.1300	20.4032	20.4901	20.4820	20.2973	19.8044	19.1567	18.5403	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8148	0.7905	0.7545	0.6852	0.5824	0.4492	0.3515	0.3689	0.5317	0.6864	0.7773	0.8230	(94)
Useful gains	343.1995	350.9748	345.0622	314.5507	262.8964	195.3085	145.6979	148.2239	213.4772	272.0967	308.1964	336.2675	(95)
Ext temp.	4.7000	5.3000	6.7000	9.3000	12.3000	15.0000	16.6000	16.5000	14.1000	10.8000	7.5000	4.6000	(96)
Heat loss rate W	564.2369	547.8415	505.2154	416.4506	314.6473	213.8470	153.0176	156.6328	245.2775	360.7504	467.0087	560.1930	(97)
Space heating kWh	164.4518	132.2944	119.1540	73.3680	38.5027	0.0000	0.0000	0.0000	0.0000	65.9583	114.3449	166.6006	(98a)
Space heating requirement - total per year (kWh/year)												874.6747	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	164.4518	132.2944	119.1540	73.3680	38.5027	0.0000	0.0000	0.0000	0.0000	65.9583	114.3449	166.6006	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												874.6747	
Space heating per m2											(98c) / (4) =	17.8980	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Fraction of main heating from main system 2	0.0000 (203)
Fraction of total heating from main system 1	1.0000 (204)
Fraction of total heating from main system 2	0.0000 (205)
Efficiency of main space heating system 1 (in %)	100.0000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	164.4518	132.2944	119.1540	73.3680	38.5027	0.0000	0.0000	0.0000	0.0000	65.9583	114.3449	166.6006	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	164.4518	132.2944	119.1540	73.3680	38.5027	0.0000	0.0000	0.0000	0.0000	65.9583	114.3449	166.6006	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	194.9612	172.1797	182.2779	158.6865	152.7661	136.4987	133.8510	139.7965	142.0329	159.7690	171.5936	192.6210	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month	60.0768	53.0567	56.1685	48.8988	47.0745	42.0617	41.2458	43.0779	43.7671	49.2324	52.8761	59.3557	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	15.6682	14.1519	15.6682	15.1628	15.6682	15.1628	15.6682	15.6682	15.1628	15.6682	15.1628	15.6682	(231)
Lighting	17.2805	13.8631	12.4822	9.1450	7.0638	5.7712	6.4439	8.3760	10.8796	14.2746	16.1231	17.7608	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												874.6747	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												324.5200	
Water heating fuel used												596.8921	(219)

Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.2180)		
mechanical ventilation fans (SFP = 1.2180)	184.4804	(230a)
Total electricity for the above, kWh/year	184.4804	(231)
Electricity for lighting (calculated in Appendix L)	139.4638	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	1795.5111	(238)

10a. Fuel costs - using BEDF prices (583)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	874.6747	28.4300	248.6700	(240)
Space heating - main system 2	0.0000	28.4300	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	596.8921	28.4300	169.6964	(247)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(247a)
Pumps, fans and electric keep-hot	184.4804	28.4300	52.4478	(249)
Energy for lighting	139.4638	28.4300	39.6496	(250)
Additional standing charges			0.0000	(251)
Total energy cost			510.4638	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	874.6747	0.1545	135.1696	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	596.8921	0.1411	84.2266	(264)
Space and water heating			219.3962	(265)
Pumps, fans and electric keep-hot	184.4804	0.1387	25.5897	(267)
Energy for lighting	139.4638	0.1443	20.1289	(268)
Total CO2, kg/year			265.1149	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	874.6747	1.5721	1375.1148	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	596.8921	1.5218	908.3378	(278)
Space and water heating			2283.4526	(279)
Pumps, fans and electric keep-hot	184.4804	1.5128	279.0820	(281)
Energy for lighting	139.4638	1.5338	213.9142	(282)
Total Primary energy kWh/year			2776.4488	(286)

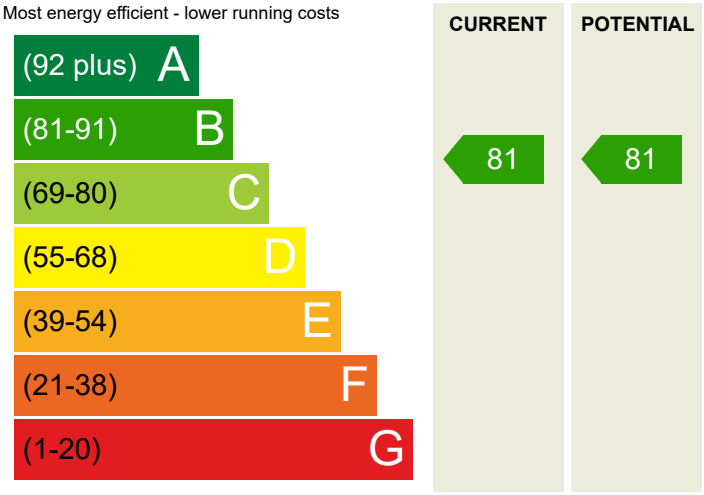
Energy Report

Dwelling Address	2 Shepherd Street, MANCHESTER, M9 4QW
Reference	78449-24-001
Assessment Date	02/07/2025
Submission Date	18/08/2025
Property Type	Flat, End-Terrace
Total Floor Area	49

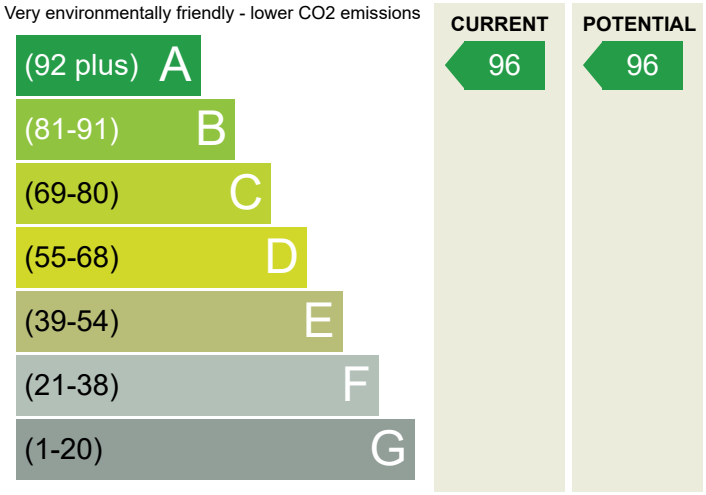
This Energy Report has been generated using the UK's National Calculation Methodology for dwellings, Standard Assessment Procedure (SAP). This methodology is used to assess the energy efficiency of dwellings which is calculated based on a dwelling's heating, hot water, ventilation and lighting usage.

This document is not an Energy Performance Certificate (EPC) as required by the Energy Performance of Buildings Regulations

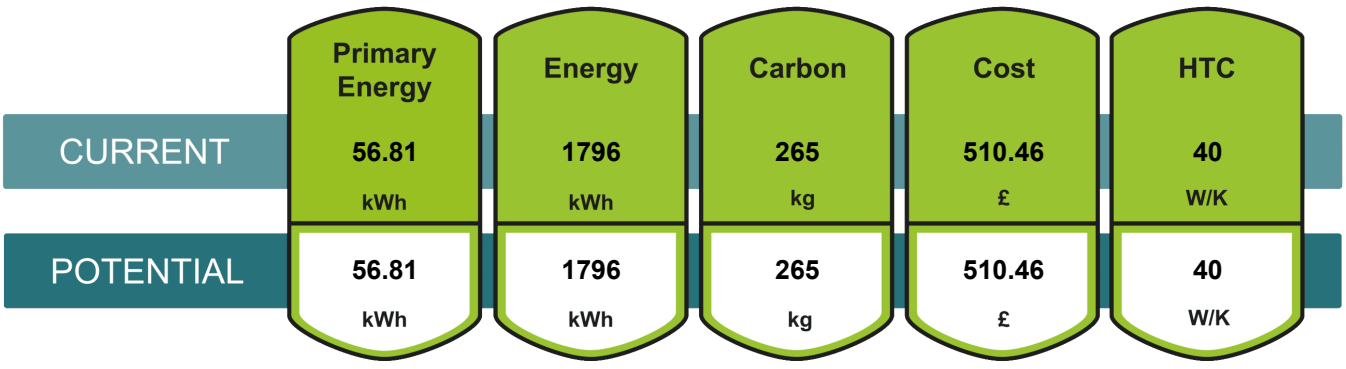
Energy Efficiency Rating



Carbon Dioxide (CO2) Emissions Rating



Additional ratings for your home



Energy Report

Breakdown of property's energy performance

Each feature is assessed as one of the following:

Very Poor	Poor	Average	Good	Very Good

Feature	Description	Energy Performance
Walls	Average thermal transmittance 0.13 W/m²K	Very Good
Roof	Average thermal transmittance 0.11 W/m²K	Very Good
Floor	Average thermal transmittance 0.11 W/m²K	Very Good
Windows	High performance glazing	Very Good
Main heating	Room heaters, electric	Very Poor
Main heating controls	Programmer and room thermostat	Good
Secondary heating	None	
Hot water	From main system	Very Good
Lighting	Good lighting efficiency	Good
Air tightness	Air permeability [AP50] = 2.8 m³/h.m² (as tested)	Very Good

Recommendations

The recommended measures provided below will help to improve the energy efficiency of the dwelling.
To reach the dwelling's potential energy rating all of the recommended measures shown below would need to be installed.
Having these measures installed individually or in any other order may give a different result when compared with the cumulative potential rating.

Recommended measures	Cumulative savings (per year)	Cumulative rating	Typical costs	Incremental savings (per year)	Cumulative CO2 rating

The typical cost is based on average installation prices across the country so may not be representative of the actual costs in your area.

Estimated energy costs of the dwelling

Energy Report

The table below shows the estimated running costs of the space and water heating and lighting within the dwelling. It does not include the energy used from household appliances. The estimated annual costs after potential improvements indicates the total energy cost if all recommended measures named above were installed.

	Estimated annual costs	Estimated annual costs after potential improvements	Potential future savings
Lighting	£40	£40	
Heating	£301	£301	
Hot Water	£170	£170	
New Technologies e.g. Impact of PV	£0	£0	
TOTAL	£510	£510	

Estimated energy use and potential savings

Space Heating
875
kWh per year

Water Heating
597
kWh per year

About this document

Created by:	
Company/Trading name:	
Phone number:	
Email address:	

Disclaimer

This Energy Report should not under any circumstances be treated as a Condition Survey and cannot be used to indicate that any element of the dwelling (e.g.heating system) is working correctly.
This Energy Report must not be used in situations where an Energy Performance Certificate (EPC) is required.
This Energy Report is generated from a set of data inputs which may not reflect the actual dimensions, services or construction of the dwelling.
The calculation used to generate this report reflects the SAP Methodology current at the time of report generation.

Glossary terms for additional metrics

Primary Energy	The measure of the energy required for lighting, heating and hot water in a property. This includes the efficiency of the property's heating system, power station efficiency for electricity and the energy used to produce the fuel and deliver it to the property.
Energy Used	The estimated amount of fuel energy for lighting, heating and hot water for the property. The estimate is based on typical usage which is likely to be different to actual consumption.
Carbon (CO2)	The current emissions based on the energy estimates.
Cost	The estimated cost of energy. The cost of each unit of fuel is based on an industry standard which is likely to be different to those the occupier actually pays.
Heat Transfer Coefficient	Heat flow through the property envelope where internal and external temperatures are different.