

Building Regulations England Part L (BREL) Compliance Report

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

Date: Wed 25 Feb 2026 11:19:12

Project Information			
Assessed By	George Achilleos	Building Type	Flat, Mid-terrace
OCDEA Registration	EES/021760	Assessment Date	2026-02-25

Dwelling Details			
Assessment Type	As designed	Total Floor Area	55 m ²
Site Reference	M11 1JJ	Plot Reference	1 BED
Address	1295 Ashton Old Road, MANCHESTER, M11 1JS		

Client Details	
Name	Jude Baiden
Company	Sterling Projects
Address	121 Tottenham Lane, Crouch End, London, N8 9BJ

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	11.25 kgCO ₂ /m ²		
Dwelling carbon dioxide emission rate	-2.99 kgCO ₂ /m ²		OK

1b Target primary energy rate and dwelling primary energy			
Target primary energy	60.15 kWh _{PE} /m ²		
Dwelling primary energy	-9.83 kWh _{PE} /m ²		OK

1c Target fabric energy efficiency and dwelling fabric energy efficiency			
Target fabric energy efficiency	17.2 kWh/m ²		
Dwelling fabric energy efficiency	16.5 kWh/m ²		OK

2a Fabric U-values				
Element	Maximum permitted average U-Value [W/m ² K]	Dwelling average U-Value [W/m ² K]	Element with highest individual U-Value	
External walls	0.26	0.12	Walls (1) (0.12)	OK
Party walls	0.2	0	Party Wall (1) (0)	N/A
Curtain walls	1.6	0	N/A	N/A
Floors	0.18	N/A	N/A	N/A
Roofs	0.16	N/A	N/A	N/A
Windows, doors, and roof windows	1.6	1.4	Opening (1.4)	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 ² K]	
Sheltered wall: Walls (1)	34.7592	0.12 (!)	
Party wall: Party Wall (1)	37.33	0 (!)	

2c Openings (better than typically expected values are flagged with a subsequent (!))				
Name	Area [m ²]	Orientation	Frame factor	U-Value [W/m ² K]
Opening, GLAZING	4.6704	South	0.7	1.4
Opening, GLAZING	4.6704	South	0.7	1.4

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
			(!)	

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	4.5 m ³ /hm ² , Design value		
Air permeability test certificate reference			

4 Space heating		
Main heating system 1: Heat pump with radiators or underfloor heating - Electricity		
Efficiency	253.3%	
Emitter type	Radiators	
Flow temperature	35°C	
System type	Heat Pump	
Manufacturer	Mitsubishi Electric Europe B.V.	
Model	Ecodan 11.2kW	
Commissioning		
Secondary heating system: N/A		
Fuel	N/A	
Efficiency	N/A	
Commissioning		
5 Hot water		
Cylinder/store - type: Cylinder		
Capacity	150 litres	
Declared heat loss	1.69 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: Time and temperature zone control by arrangement of plumbing and electrical services		
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	150 lm/W	OK
External lights control	N/A	
8 Mechanical ventilation		
System type: N/A		
Maximum permitted specific fan power	N/A	
Specific fan power	N/A	N/A
Minimum permitted heat recovery efficiency	N/A	
Heat recovery efficiency	N/A	N/A
Manufacturer/Model		
Commissioning		
9 Local generation		
Technology type: Photovoltaic system (1)		
Peak power	3.8 kWp	
Orientation	South	
Pitch	45°	
Overshading	None or very little	
Manufacturer		
MCS certificate		
10 Heat networks		
N/A		
11 Supporting documentary evidence		
N/A		

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 information submitted for this dwelling for the purpose of carrying out the "As designed" assessment, and that the supporting documentary evidence (SAP Conventions, Appendix 1 (documentary evidence) schedules the minimum documentary evidence required) has been reviewed in the course of preparing this BREL Compliance Report.	
Signed: Name:	Assessor ID: Date:
b. Client Declaration	
N/A	

Full SAP Calculation Printout



Plot Reference	M11 1JJ			Issued on Date	25/02/2026
Assessment Reference	1 BED	Plot Type Ref			
Plot Address	1295, Ashton Old Road, MANCHESTER, M11 1JS			SAP Version	10.2
SAP Rating	105 A	DER	-2.99	TER	11.25
Environmental	102 A	% DER < TER			126.58
CO ₂ Emissions (t/year)	-0.14	DFEE	16.54	TFEE	17.21
Compliance Check	See BREL	% DFEE < TFEE			3.91
% DPER < TPER	116.34	DPER	-9.83	TPER	60.15
Assessor Details	Mr. George Achilleos			Assessor ID	K679-0001
Client	Sterling Projects, Jude Baiden				

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	54.7600 (1b)	2.8000 (2b)	153.3280 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	54.7600		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	153.3280 (5)

2. Ventilation rate

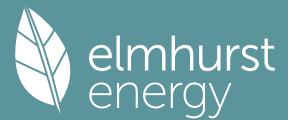
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	1 * 10 = 10.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	10.0000 / (5) = 0.0652 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.5000 (17)
Infiltration rate	0.2902 (18)
Number of sides sheltered	3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.2249 (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												
Effective ac	0.2868	0.2812	0.2755	0.2474	0.2418	0.2137	0.2137	0.2081	0.2249	0.2418	0.2530	0.2643 (22b)
	0.5411	0.5395	0.5380	0.5306	0.5292	0.5228	0.5228	0.5216	0.5253	0.5292	0.5320	0.5349 (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					
GLAZING			9.3400	1.3258	12.3826		(27)					
External Wall 1	44.1000	9.3400	34.7600	0.1200	4.1712	190.0000	6604.4000 (29a)					
Total net area of external elements Aum(A, m2)			44.1000				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		16.5538		(33)					
Main dwelling												
Party Wall 1			37.3300	0.0000	0.0000	20.0000	746.6000 (32)					
Party Floor 1			54.7600			40.0000	2190.4000 (32d)					
Party Ceiling 1			54.7600			30.0000	1642.8000 (32b)					
Internal Wall 1			48.4800			9.0000	436.3200 (32c)					
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		11620.5200 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							212.2082 (35)					
List of Thermal Bridges												
K1 Element				Length	Psi-value	Total						
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							0.0000 (36)					
Point Thermal bridges						(36a) =	0.0000					
Total fabric heat loss					(33) + (36) + (36a) =		16.5538 (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

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(38)m	27.3797	27.2989	27.2197	26.8478	26.7782	26.4542	26.4542	26.3942	26.5790	26.7782	26.9189	27.0661 (38)
Heat transfer coeff	43.9335	43.8527	43.7735	43.4015	43.3319	43.0080	43.0080	42.9480	43.1328	43.3319	43.4727	43.6199 (39)
Average = Sum(39)m / 12 =												43.4012
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.8023	0.8008	0.7994	0.7926	0.7913	0.7854	0.7854	0.7843	0.7877	0.7913	0.7939	0.7966 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	0.7926 (40)
												31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.8303 (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	63.2632	62.3237	61.0006	58.5611	56.7344	54.7089	53.6148	54.9287	56.3592	58.5265	61.0163	63.0494 (42b)
Hot water usage for other uses	33.3743	32.1607	30.9471	29.7335	28.5199	27.3063	27.3063	28.5199	29.7335	30.9471	32.1607	33.3743 (42c)
Average daily hot water use (litres/day)												88.9953 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	153.0503	134.5446	141.3203	120.8709	114.7687	100.8472	97.8671	103.3267	106.1609	121.4149	132.7478	150.9762 (44)
Energy content (annual)												1477.8956 (45)
Distribution loss (46)m = 0.15 x (45)m	22.9575	20.1817	21.1980	18.1306	17.2153	15.1271	14.6801	15.4990	15.9241	18.2122	19.9122	22.6464 (46)
Water storage loss (or HIU loss):												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6900 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.9126 (55)
Total storage loss	28.2906	25.5528	28.2906	27.3780	28.2906	27.3780	28.2906	28.2906	27.3780	28.2906	27.3780	28.2906 (56)
If cylinder contains dedicated solar storage	28.2906	25.5528	28.2906	27.3780	28.2906	27.3780	28.2906	28.2906	27.3780	28.2906	27.3780	28.2906 (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	204.6033	181.1086	192.8733	170.7609	166.3217	150.7372	149.4201	154.8797	156.0509	172.9679	182.6378	202.5292 (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	204.6033	181.1086	192.8733	170.7609	166.3217	150.7372	149.4201	154.8797	156.0509	172.9679	182.6378	202.5292 (64)
Total per year (kWh/year)												2084.8906 (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	92.1316	81.9873	88.2314	80.1016	79.4030	73.4437	73.7832	75.5985	75.2105	81.6129	84.0506	91.4420 (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	91.5162	91.5162	91.5162	91.5162	91.5162	91.5162	91.5162	91.5162	91.5162	91.5162	91.5162	91.5162 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	82.9583	81.8466	82.9583	85.7235	82.9583	85.7235	82.9583	82.9583	85.7235	82.9583	85.7235	82.9583 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	159.5669	161.2227	157.0501	148.1672	136.9541	126.4154	119.3749	117.7191	121.8917	130.7746	141.9877	152.5264 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.1516	32.1516	32.1516	32.1516	32.1516	32.1516	32.1516	32.1516	32.1516	32.1516	32.1516	32.1516 (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)	-73.2130	-73.2130	-73.2130	-73.2130	-73.2130	-73.2130	-73.2130	-73.2130	-73.2130	-73.2130	-73.2130	-73.2130 (71)
Water heating gains (Table 5)	123.8328	122.0049	118.5906	111.2522	106.7244	102.0052	99.1710	101.6109	104.4590	109.6947	116.7370	122.9059 (72)
Total internal gains	416.8129	425.5291	409.0538	395.5978	377.0917	364.5989	351.9590	352.7431	362.5291	373.8824	394.9030	408.8454 (73)

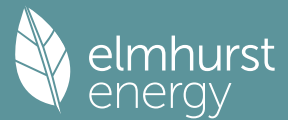
6. Solar gains

[Jan]												Gains
				Area	Solar flux		g		FF		Access	
				m2	Table 6a	Specific data	or Table 6b	Specific data	or Table 6c		factor	W
					W/m2						Table 6d	
South				9.3400	46.7521		0.6300		0.7000		0.7700	133.4503 (78)
Solar gains	133.4503	218.5572	278.4031	314.6559	327.8909	315.5504	308.3119	299.4136	290.8249	235.7344	158.1841	115.3133 (83)
Total gains	550.2631	644.0862	687.4569	710.2537	704.9826	680.1493	660.2709	652.1567	653.3539	609.6168	553.0871	524.1587 (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)												
tau	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
alpha	5.8982	5.9072	5.9161	5.9582	5.9662	6.0036	6.0036	6.0106	5.9891	5.9662	5.9501	5.9334
util living area	0.9469	0.8914	0.8192	0.7031	0.5627	0.4036	0.2865	0.3028	0.4533	0.7030	0.8911	0.9568 (86)
Living	20.4906	20.6840	20.8284	20.9380	20.9850	20.9983	20.9998	20.9997	20.9965	20.9470	20.7326	20.4452
Non living	19.6811	19.9123	20.0791	20.2025	20.2490	20.2650	20.2659	20.2669	20.2618	20.2146	19.9791	19.6300

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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	20.7394	20.6840	20.8284	20.9380	20.9850	20.9983	20.9998	20.9997	20.9965	20.9470	20.7326	20.5228 (87)
Th 2	20.2513	20.2526	20.2539	20.2598	20.2609	20.2660	20.2660	20.2670	20.2640	20.2609	20.2586	20.2563 (88)
util rest of house												
	0.9364	0.8735	0.7931	0.6680	0.5207	0.3578	0.2388	0.2546	0.4058	0.6621	0.8701	0.9480 (89)
MIT 2	20.0240	19.9123	20.0791	20.2025	20.2490	20.2650	20.2659	20.2669	20.2618	20.2146	19.9791	19.7428 (90)
Living area fraction									FLA = Living area / (4) =			0.4819 (91)
MIT	20.3688	20.2842	20.4402	20.5570	20.6037	20.6184	20.6196	20.6201	20.6159	20.5676	20.3422	20.1187 (92)
Temperature adjustment												0.0000
adjusted MIT	20.3688	20.2842	20.4402	20.5570	20.6037	20.6184	20.6196	20.6201	20.6159	20.5676	20.3422	20.1187 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9382	0.8743	0.7999	0.6823	0.5404	0.3798	0.2618	0.2778	0.4286	0.6794	0.8727	0.9461 (94)
Useful gains	516.2501	563.1057	549.8825	484.6357	380.9510	258.3522	172.8346	181.1833	280.0200	414.1956	482.6643	495.9172 (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	705.9563	674.6377	610.2112	505.9302	385.8131	258.8382	172.8755	181.2428	281.0468	431.9134	575.6750	694.3724 (97)
Space heating kWh	141.1414	74.9495	44.8845	15.3320	3.6174	0.0000	0.0000	0.0000	0.0000	13.1820	66.9677	147.6506 (98a)
Space heating requirement - total per year (kWh/year)												507.7252
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	141.1414	74.9495	44.8845	15.3320	3.6174	0.0000	0.0000	0.0000	0.0000	13.1820	66.9677	147.6506 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												507.7252
Space heating per m2										(98c) / (4) =		9.2718 (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 %)												253.3058 (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	141.1414	74.9495	44.8845	15.3320	3.6174	0.0000	0.0000	0.0000	0.0000	13.1820	66.9677	147.6506 (98)
Space heating efficiency (main heating system 1)	253.3058	253.3058	253.3058	253.3058	253.3058	0.0000	0.0000	0.0000	0.0000	253.3058	253.3058	253.3058 (210)
Space heating fuel (main heating system)	55.7198	29.5885	17.7195	6.0528	1.4281	0.0000	0.0000	0.0000	0.0000	5.2040	26.4375	58.2895 (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	204.6033	181.1086	192.8733	170.7609	166.3217	150.7372	149.4201	154.8797	156.0509	172.9679	182.6378	202.5292 (64)
Efficiency of water heater (217)m	155.6147	155.6147	155.6147	155.6147	155.6147	155.6147	155.6147	155.6147	155.6147	155.6147	155.6147	155.6147 (216)
Fuel for water heating, kWh/month	131.4807	116.3827	123.9428	109.7331	106.8804	96.8657	96.0193	99.5277	100.2803	111.1514	117.3654	130.1479 (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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	32.5659	26.1256	23.5232	17.2341	13.3121	10.8761	12.1438	15.7849	20.5031	26.9011	30.3848	33.4711 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-87.5343	-123.2668	-171.7852	-183.3478	-190.4068	-174.9293	-173.3928	-169.2637	-157.1059	-138.1798	-96.4548	-75.6769 (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	-18.7963	-48.1281	-105.7893	-170.6693	-233.3995	-236.6953	-234.8862	-196.0949	-141.6736	-76.8642	-28.4361	-14.1577 (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												200.4396 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												155.6147
Water heating fuel used												1339.7774 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
Total electricity for the above, kWh/year												0.0000 (231)
Electricity for lighting (calculated in Appendix L)												262.8259 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-3246.9343 (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												-1443.8914 (238)

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

	Energy kWh/year	Emission factor kg CO ₂ /kWh	Emissions kg CO ₂ /year
Space heating - main system 1	200.4396	0.1586	31.7826 (261)
Total CO ₂ associated with community systems			0.0000 (373)
Water heating (other fuel)	1339.7774	0.1407	188.5321 (264)
Space and water heating			220.3147 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	262.8259	0.1443	37.9339 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1741.3439	0.1353	-235.6814
PV Unit electricity exported	-1505.5904	0.1237	-186.2846
Total			-421.9660 (269)
Total CO ₂ , kg/year			-163.7174 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			-2.9900 (273)

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

	Energy kWh/year	Primary energy factor kg CO ₂ /kWh	Primary energy kWh/year
Space heating - main system 1	200.4396	1.5869	318.0788 (275)
Total CO ₂ associated with community systems			0.0000 (473)
Water heating (other fuel)	1339.7774	1.5203	2036.8886 (278)
Space and water heating			2354.9674 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	262.8259	1.5338	403.1311 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1741.3439	1.5003	-2612.4677
PV Unit electricity exported	-1505.5904	0.4541	-683.7180
Total			-3296.1857 (283)
Total Primary energy kWh/year			-538.0872 (286)
Dwelling Primary energy Rate (DPER)			-9.8300 (287)

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling	54.7600 (1b)	x 2.8000 (2b)	= 153.3280 (1b) - (3b)
Ground floor			(4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	54.7600		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 153.3280 (5)
Dwelling volume			

2. Ventilation rate

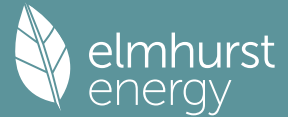
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	Air changes per hour 20.0000 / (5) = 0.1304 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3804 (18)
Number of sides sheltered	3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.2948 (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	0.3759	0.3686	0.3612	0.3243	0.3170	0.2801	0.2801	0.2727	0.2948	0.3170	0.3317	0.3464 (22b)
Effective ac	0.5707	0.5679	0.5652	0.5526	0.5502	0.5392	0.5392	0.5372	0.5435	0.5502	0.5550	0.5600 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
TER Opening Type			9.3400	1.1450	10.6947		(27)
External Wall 1	44.1000	9.3400	34.7600	0.1800	6.2568		(29a)
Total net area of external elements Aum(A, m ²)			44.1000				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 16.9515		(33)

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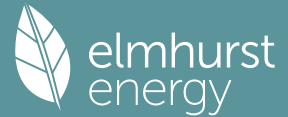
Main dwelling													
Party Wall 1													
						37.3300	0.0000	0.0000					(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K													212.2082 (35)
List of Thermal Bridges													
K1 Element													
Thermal bridges (Sum(L x Psi) calculated using Appendix K)									Length	Psi-value		Total	0.0000 (36)
Point Thermal bridges												(36a) =	0.0000
Total fabric heat loss												(33) + (36) + (36a) =	16.9515 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	28.8743	28.7355	28.5994	27.9602	27.8407	27.2840	27.2840	27.1809	27.4984	27.8407	28.0826	28.3355	(38)
Average = Sum(39)m / 12 =													
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	0.8368	0.8343	0.8318	0.8202	0.8180	0.8078	0.8078	0.8059	0.8117	0.8180	0.8224	0.8270	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)													
Assumed occupancy													1.8303 (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													
	63.2632	62.3237	61.0006	58.5611	56.7344	54.7089	53.6148	54.9287	56.3592	58.5265	61.0163	63.0494	(42b)
Hot water usage for other uses													
	33.3743	32.1607	30.9471	29.7335	28.5199	27.3063	27.3063	28.5199	29.7335	30.9471	32.1607	33.3743	(42c)
Average daily hot water use (litres/day)													88.9953 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	96.6376	94.4844	91.9477	88.2946	85.2543	82.0152	80.9211	83.4486	86.0927	89.4737	93.1770	96.4237	(44)
Energy content (annual)	153.0503	134.5446	141.3203	120.8709	114.7687	100.8472	97.8671	103.3267	106.1609	121.4149	132.7478	150.9762	(45)
Distribution loss													
	22.9575	20.1817	21.1980	18.1306	17.2153	15.1271	14.6801	15.4990	15.9241	18.2122	19.9122	22.6464	(46)
Water storage loss (or HIU 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													
	199.6452	176.6303	187.9152	165.9627	161.3636	145.9391	144.4620	149.9216	151.2527	168.0098	177.8396	197.5712	(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	199.6452	176.6303	187.9152	165.9627	161.3636	145.9391	144.4620	149.9216	151.2527	168.0098	177.8396	197.5712	(64)
12Total per year (kWh/year)													2026.5130 (64)
Electric shower(s)													2027 (64)
	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													
	88.1652	78.4046	84.2649	76.2630	75.4365	69.6052	69.8167	71.6321	71.3720	77.6464	80.2121	87.4755	(65)

5. Internal gains (see Table 5 and 5a)													
Metabolic gains (Table 5), Watts													
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	91.5162	91.5162	91.5162	91.5162	91.5162	91.5162	91.5162	91.5162	91.5162	91.5162	91.5162	91.5162	(66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	82.9583	91.8466	82.9583	85.7235	82.9583	85.7235	82.9583	82.9583	85.7235	82.9583	85.7235	82.9583	(67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	159.5669	161.2227	157.0501	148.1672	136.9541	126.4154	119.3749	117.7191	121.8917	130.7746	141.9877	152.5264	(68)
Pumps, fans	32.1516	32.1516	32.1516	32.1516	32.1516	32.1516	32.1516	32.1516	32.1516	32.1516	32.1516	32.1516	(69)
Losses e.g. evaporation (negative values) (Table 5)	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)
Water heating gains (Table 5)	-73.2130	-73.2130	-73.2130	-73.2130	-73.2130	-73.2130	-73.2130	-73.2130	-73.2130	-73.2130	-73.2130	-73.2130	(71)
Total internal gains	118.5016	116.6736	113.2593	105.9209	101.3932	96.6739	93.8397	96.2797	99.1277	104.3634	111.4057	117.5746	(72)
	414.4816	423.1978	406.7225	393.2665	374.7604	359.2676	346.6277	347.4118	357.1978	371.5511	392.5717	406.5141	(73)

6. Solar gains													
[Jan]													
				Area	Solar flux		g	FF		Access		Gains	
				m2	Table 6a		or Table 6b	Specific data		factor		W	
					W/m2			or Table 6c		Table 6d			
South				9.3400	46.7521		0.6300	0.7000		0.7700		133.4503	(78)
Solar gains	133.4503	218.5572	278.4031	314.6559	327.8909	315.5504	308.3119	299.4136	290.8249	235.7344	158.1841	115.3133	(83)
Total gains	547.9319	641.7550	685.1256	707.9224	702.6513	674.8180	654.9396	646.8255	648.0227	607.2855	550.7558	521.8275	(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	70.4390	70.6531	70.8641	71.8726	72.0645	72.9714	72.9714	73.1419	72.6194	72.0645	71.6774	71.2771	
alpha	5.6959	5.7102	5.7243	5.7915	5.8043	5.8648	5.8648	5.8761	5.8413	5.8043	5.7785	5.7518	
util living area	0.9526	0.9024	0.8353	0.7214	0.5809	0.4180	0.2970	0.3136	0.4701	0.7212	0.9011	0.9610 (86)	
MIT	20.4215	20.6279	20.7900	20.9219	20.9800	20.9976	20.9997	20.9996	20.9951	20.9335	20.6908	20.3822 (87)	
Th 2	20.2215	20.2237	20.2258	20.2359	20.2378	20.2466	20.2466	20.2482	20.2432	20.2378	20.2340	20.2300 (88)	
util rest of house	0.9429	0.8854	0.8097	0.6857	0.5369	0.3695	0.2462	0.2625	0.4198	0.6794	0.8811	0.9528 (89)	
MIT 2	19.5718	19.8211	20.0106	20.1633	20.2219	20.2452	20.2465	20.2481	20.2401	20.1793	19.9089	19.5307 (90)	
Living area fraction									fLA = Living area / (4) =				0.4819 (91)
MIT	19.9813	20.2099	20.3862	20.5289	20.5872	20.6078	20.6095	20.6103	20.6039	20.5428	20.2857	19.9410 (92)	
Temperature adjustment												0.0000	
adjusted MIT	19.9813	20.2099	20.3862	20.5289	20.5872	20.6078	20.6095	20.6103	20.6039	20.5428	20.2857	19.9410 (93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9395	0.8850	0.8153	0.6997	0.5573	0.3928	0.2707	0.2871	0.4439	0.6966	0.8826	0.9493 (94)
Useful gains	514.7611	567.9687	558.5595	495.3279	391.5647	265.0731	177.3004	185.7215	287.6578	423.0208	486.0725	495.3584 (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	718.6076	699.4628	632.5301	522.2725	398.0775	265.7560	177.3613	185.8084	289.0985	445.3569	593.8061	712.8637 (97)
Space heating kWh	151.6618	88.3641	55.0341	19.4001	4.8455	0.0000	0.0000	0.0000	0.0000	16.6180	77.5682	161.8239 (98a)
Space heating requirement - total per year (kWh/year)												575.3157
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	151.6618	88.3641	55.0341	19.4001	4.8455	0.0000	0.0000	0.0000	0.0000	16.6180	77.5682	161.8239 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												575.3157
Space heating per m2										(98c) / (4) =		10.5061 (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	151.6618	88.3641	55.0341	19.4001	4.8455	0.0000	0.0000	0.0000	0.0000	16.6180	77.5682	161.8239 (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)	164.3139	95.7357	59.6252	21.0185	5.2498	0.0000	0.0000	0.0000	0.0000	18.0044	84.0392	175.3238 (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	199.6452	176.6303	187.9152	165.9627	161.3636	145.9391	144.4620	149.9216	151.2527	168.0098	177.8396	197.5712 (64)	
Efficiency of water heater (217)m	83.4513	82.5913	81.6751	80.6555	80.0365	79.8000	79.8000	79.8000	79.8000	80.5347	82.3343	79.8000 (216)	
Fuel for water heating, kWh/month	239.2355	213.8607	230.0763	205.7673	201.6125	182.8811	181.0300	187.8717	189.5398	208.6180	215.9969	236.2844 (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	17.2371	13.8282	12.4508	9.1220	7.0461	5.7567	6.4277	8.3549	10.8522	14.2387	16.0826	17.7162 (232)	
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-12.2313	-18.3955	-28.1898	-33.8669	-38.4644	-36.6349	-36.2043	-33.2124	-28.2802	-21.9788	-13.8543	-10.4457 (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	-3.8046	-8.2293	-16.7834	-25.8437	-34.7973	-35.1810	-34.7524	-29.1240	-20.9664	-11.9579	-5.1404	-2.9911 (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													623.3106 (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													2492.7743 (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)													139.1132 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation													-541.3300 (233)
Wind generation													0.0000 (234)
Hydro-electric generation (Appendix N)													0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)													0.0000 (235)

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Appendix Q - special features

Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	2799.8680 (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	623.3106	0.2100	130.8952 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2492.7743	0.2100	523.4826 (264)
Space and water heating			654.3778 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	139.1132	0.1443	20.0783 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-311.7586	0.1332	-41.5389
PV Unit electricity exported	-229.5714	0.1252	-28.7387
Total			-70.2776 (269)
Total CO2, kg/year			616.1078 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.2500 (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	623.3106	1.1300	704.3410 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2492.7743	1.1300	2816.8349 (278)
Space and water heating			3521.1759 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	139.1132	1.5338	213.3764 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-311.7586	1.4924	-465.2553
PV Unit electricity exported	-229.5714	0.4595	-105.4831
Total			-570.7384 (283)
Total Primary energy kWh/year			3293.9147 (286)
Target Primary Energy Rate (TPER)			60.1500 (287)

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling	54.7600	2.8000	153.3280
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	54.7600		153.3280
Dwelling volume			153.3280

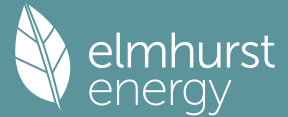
2. Ventilation rate

	m ³ 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)

Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1304 (8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		4.5000	(17)
Infiltration rate		0.3554	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2755	(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	0.3512	0.3443	0.3374	0.3030	0.2961	0.2617	0.2617	0.2548	0.2755	0.2961	0.3099	0.3237 (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	0.5617	0.5593	0.5569	0.5459	0.5438	0.5342	0.5342	0.5325	0.5379	0.5438	0.5480	0.5524 (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						
GLAZING			9.3400	1.3258	12.3826			(27)					
External Wall 1	44.1000	9.3400	34.7600	0.1200	4.1712	190.0000	6604.4000	(29a)					
Total net area of external elements Aum(A, m2)			44.1000					(31)					
Fabric heat loss, W/K = Sum (A x U)			(26)... (30) + (32) =		16.5538			(33)					
Main dwelling													
Party Wall 1			37.3300	0.0000	0.0000	20.0000	746.6000	(32)					
Party Floor 1			54.7600			40.0000	2190.4000	(32d)					
Party Ceiling 1			54.7600			30.0000	1642.8000	(32b)					
Internal Wall 1			48.4800			9.0000	436.3200	(32c)					
Heat capacity Cm = Sum(A x k)					(28)... (30) + (32) + (32a)... (32e) =		11620.5200	(34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							212.2082	(35)					
List of Thermal Bridges													
K1 Element					Length	Psi-value	Total						
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							0.0000	(36)					
Point Thermal bridges							(36a) =	0.0000					
Total fabric heat loss						(33) + (36) + (36a) =	16.5538	(37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	28.4199	28.2987	28.1799	27.6220	27.5176	27.0317	27.0317	26.9417	27.2188	27.5176	27.7288	27.9495	(38)
Average = Sum(39)m / 12 =	44.9737	44.8525	44.7337	44.1758	44.0714	43.5855	43.5855	43.4955	43.7726	44.0714	44.2826	44.5033	(39)
												44.1753	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	0.8213	0.8191	0.8169	0.8067	0.8048	0.7959	0.7959	0.7943	0.7994	0.8048	0.8087	0.8127	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.8303 (42)
Hot water usage for mixer showers													
Hot water usage for baths	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 other uses	23.7355	23.3830	22.8866	21.9713	21.2860	20.5260	20.1155	20.6085	21.1452	21.9583	22.8925	23.6552	(42b)
Average daily hot water use (litres/day)	33.3743	32.1607	30.9471	29.7335	28.5199	27.3063	27.3063	28.5199	29.7335	30.9471	32.1607	33.3743	(42c)
												52.3468	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	57.1098	55.5437	53.8337	51.7048	49.8058	47.8323	47.4218	49.1284	50.8787	52.9055	55.0532	57.0296	(44)
Energy content (annual)	90.4480	79.0935	82.7404	70.7813	67.0482	58.8154	57.3526	60.8312	62.7385	71.7922	78.4334	89.2946	(45)
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 (or HIU 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	76.8808	67.2295	70.3293	60.1641	56.9910	49.9931	48.7497	51.7065	53.3277	61.0234	66.6684	75.9004	(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	76.8808	67.2295	70.3293	60.1641	56.9910	49.9931	48.7497	51.7065	53.3277	61.0234	66.6684	75.9004	(64)
12Total per year (kWh/year)													
Electric shower(s)	43.9722	39.1796	42.7826	40.8269	41.5930	39.6757	40.9982	41.5930	40.8269	42.7826	41.9781	43.9722	(64a)
Heat gains from water heating, kWh/month	30.2132	26.6023	28.2780	25.2478	24.6460	22.4172	22.4370	23.3249	23.5387	25.9515	27.1616	29.9681	(65)
												500.1811	(64a)

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	91.5162	91.5162	91.5162	91.5162	91.5162	91.5162	91.5162	91.5162	91.5162	91.5162	91.5162	91.5162	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	82.9583	81.8466	82.9583	85.7235	82.9583	85.7235	82.9583	82.9583	85.7235	82.9583	85.7235	82.9583	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	159.5669	161.2227	157.0501	148.1672	136.9541	126.4154	119.3749	117.7191	121.8917	130.7746	141.9877	152.5264	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.1516	32.1516	32.1516	32.1516	32.1516	32.1516	32.1516	32.1516	32.1516	32.1516	32.1516	32.1516	(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)	-73.2130	-73.2130	-73.2130	-73.2130	-73.2130	-73.2130	-73.2130	-73.2130	-73.2130	-73.2130	-73.2130	-73.2130	(71)
Water heating gains (Table 5)	40.6092	39.5867	38.0080	35.0663	33.1264	31.1350	30.1572	31.3506	32.6926	34.8810	37.7245	40.2798	(72)
Total internal gains	333.5892	343.1109	328.4713	319.4119	303.4936	293.7288	282.9452	282.4828	290.7626	299.0687	315.8905	326.2193	(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
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South	9.3400		46.7521		0.6300		0.7000		0.7700		133.4503 (78)	
Solar gains	133.4503	218.5572	278.4031	314.6559	327.8909	315.5504	308.3119	299.4136	290.8249	235.7344	158.1841	115.3133 (83)
Total gains	467.0395	561.6681	606.8744	634.0678	631.3845	609.2792	591.2572	581.8964	581.5875	534.8031	474.0746	441.5326 (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	71.7736	71.9675	72.1586	73.0700	73.2430	74.0596	74.0596	74.2128	73.7429	73.2430	72.8938	72.5322
alpha	5.7849	5.7978	5.8106	5.8713	5.8829	5.9373	5.9373	5.9475	5.9162	5.8829	5.8596	5.8355
util living area	0.9748	0.9368	0.8800	0.7727	0.6303	0.4554	0.3241	0.3434	0.5141	0.7815	0.9403	0.9805 (86)
MIT	20.2944	20.5323	20.7264	20.8933	20.9714	20.9965	20.9996	20.9994	20.9927	20.9032	20.5939	20.2478 (87)
Th 2	20.2349	20.2368	20.2387	20.2475	20.2492	20.2569	20.2569	20.2583	20.2539	20.2492	20.2458	20.2423 (88)
util rest of house	0.9690	0.9243	0.8585	0.7386	0.5849	0.4035	0.2695	0.2883	0.4605	0.7419	0.9262	0.9760 (89)
MIT 2	19.6050	19.8340	20.0153	20.1686	20.2312	20.2552	20.2567	20.2581	20.2502	20.1809	19.9037	19.5660 (90)
Living area fraction	19.9372	20.1706	20.3580	20.5179	20.5879	20.6124	20.6147	20.6154	20.6080	20.5290	20.2363	19.8946 (92)
Temperature adjustment	19.9372	20.1706	20.3580	20.5179	20.5879	20.6124	20.6147	20.6154	20.6080	20.5290	20.2363	0.0000
adjusted MIT	19.9372	20.1706	20.3580	20.5179	20.5879	20.6124	20.6147	20.6154	20.6080	20.5290	20.2363	19.8946 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9664	0.9231	0.8621	0.7512	0.6056	0.4285	0.2958	0.3149	0.4861	0.7572	0.9260	0.9735 (94)
Useful gains	451.3682	518.4547	523.1768	476.3330	382.3900	261.0554	174.8951	183.2191	282.7278	404.9451	439.0084	429.8471 (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	703.2630	684.9220	619.9175	513.2275	391.7037	262.0551	174.9845	183.3497	284.8742	437.5858	581.7092	698.4598 (97)
Space heating kWh	187.4098	111.8660	71.9751	26.5641	6.9294	0.0000	0.0000	0.0000	0.0000	24.2847	102.7446	199.8478 (98a)
Space heating requirement - total per year (kWh/year)												731.6214
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	187.4098	111.8660	71.9751	26.5641	6.9294	0.0000	0.0000	0.0000	0.0000	24.2847	102.7446	199.8478 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												731.6214
Space heating per m2										(98c) / (4) =		13.3605 (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	409.7032	322.5323	330.5655	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9798	0.9927	0.9912	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	401.4326	320.1837	327.6630	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	680.3171	660.9551	651.6282	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	200.7968	253.5339	241.0301	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	50.1992	63.3835	60.2575	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												173.8402 (107)
Energy for space heating												13.3605 (99)
Energy for space cooling												3.1746 (108)
Total												16.5351 (109)
Fabric Energy Efficiency (DFEE)												16.5 (109)

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

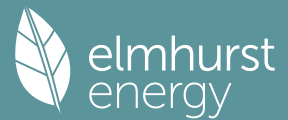
1. Overall dwelling characteristics

Main dwelling	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	54.7600 (1b)	x 2.8000 (2b)	= 153.3280 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	54.7600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	153.3280 (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)

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Number of flues attached to solid fuel boiler
Number of flues attached to other heater
Number of blocked chimneys
Number of intermittent extract fans
Number of passive vents
Number of flueless gas fires

0 * 20 = 0.0000 (6d)
0 * 35 = 0.0000 (6e)
0 * 20 = 0.0000 (6f)
2 * 10 = 20.0000 (7a)
0 * 10 = 0.0000 (7b)
0 * 40 = 0.0000 (7c)

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) = 20.0000
Air changes per hour (5) = 0.1304 (8)
Pressure test Yes
Pressure Test Method Blower Door
Measured/design AP50 5.0000 (17)
Infiltration rate 0.3804 (18)
Number of sides sheltered 3 (19)
Shelter factor (20) = 1 - [0.075 x (19)] = 0.7750 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.2948 (21)

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000
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
Adj infilt rate												
	0.3759	0.3686	0.3612	0.3243	0.3170	0.2801	0.2801	0.2727	0.2948	0.3170	0.3317	0.3464
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000
Effective ac	0.5707	0.5679	0.5652	0.5526	0.5502	0.5392	0.5392	0.5372	0.5435	0.5502	0.5550	0.5600

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 Opening Type			9.3400	1.1450	10.6947		(27)
External Wall 1	44.1000	9.3400	34.7600	0.1800	6.2568		(29a)
Total net area of external elements Aum(A, m2)			44.1000				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 16.9515		(33)
Main dwelling							
Party Wall 1			37.3300	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							212.2082 (35)
List of Thermal Bridges							
Kl Element					Length	Psi-value	Total
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							0.0000 (36)
Point Thermal bridges							0.0000
Total fabric heat loss						(33) + (36) + (36a) =	16.9515 (37)

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

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	28.8743	28.7355	28.5994	27.9602	27.8407	27.2840	27.2840	27.1809	27.4984	27.8407	28.0826	28.3355
Heat transfer coeff	45.8258	45.6869	45.5509	44.9117	44.7921	44.2354	44.2354	44.1323	44.4499	44.7921	45.0340	45.2870
Average = Sum(39)m / 12 =												44.9111

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.8368	0.8343	0.8318	0.8202	0.8180	0.8078	0.8078	0.8059	0.8117	0.8180	0.8224	0.8270
HLP (average)												0.8201
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.8303 (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

Hot water usage for baths

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	23.7355	23.3830	22.8866	21.9713	21.2860	20.5260	20.1155	20.6085	21.1452	21.9583	22.8925	23.6552

Hot water usage for other uses

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	33.3743	32.1607	30.9471	29.7335	28.5199	27.3063	27.3063	28.5199	29.7335	30.9471	32.1607	33.3743

Average daily hot water use (litres/day)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	57.1098	55.5437	53.8337	51.7048	49.8058	47.8323	47.4218	49.1284	50.8787	52.9055	55.0532	57.0296

Energy conte

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	90.4480	79.0935	82.7404	70.7813	67.0482	58.8154	57.3526	60.8312	62.7385	71.7922	78.4334	89.2946

Energy content (annual)

	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

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

	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

Water storage loss (or HIU loss):

	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

Total storage loss

	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

If cylinder contains dedicated solar storage

	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

Primary loss

	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

Combi loss

	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

Total heat required for water heating calculated for each month

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	76.8808	67.2295	70.3293	60.1641	56.9910	49.9931	48.7497	51.7065	53.3277	61.0234	66.6684	75.9004

WWHRS

	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

PV diverter

	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

Solar input

	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

FGHRS

	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

Output from w/h

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	76.8808	67.2295	70.3293	60.1641	56.9910	49.9931	48.7497	51.7065	53.3277	61.0234	66.6684	75.9004

12Total per year (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	43.9722	39.1796	42.7826	40.8269	41.5930	39.6757	40.9982	41.5930	40.8269	42.7826	41.9781	43.9722

Electric shower(s)

	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

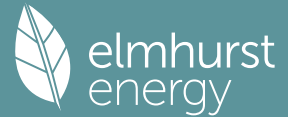
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 500.1811 (64a)

Heat gains from water heating, kWh/month

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	30.2132	26.6023	28.2780	25.2478	24.6460	22.4172	22.4370	23.3249	23.5387	25.9515	27.1616	29.9681

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

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Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	91.5162	91.5162	91.5162	91.5162	91.5162	91.5162	91.5162	91.5162	91.5162	91.5162	91.5162	91.5162	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	82.9583	91.8466	82.9583	85.7235	82.9583	85.7235	82.9583	82.9583	85.7235	82.9583	85.7235	82.9583	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	159.5669	161.2227	157.0501	148.1672	136.9541	126.4154	119.3749	117.7191	121.8917	130.7746	141.9877	152.5264	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.1516	32.1516	32.1516	32.1516	32.1516	32.1516	32.1516	32.1516	32.1516	32.1516	32.1516	32.1516	(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)	-73.2130	-73.2130	-73.2130	-73.2130	-73.2130	-73.2130	-73.2130	-73.2130	-73.2130	-73.2130	-73.2130	-73.2130	(71)
Water heating gains (Table 5)	40.6092	39.5867	38.0080	35.0663	33.1264	31.1350	30.1572	31.3506	32.6926	34.8810	37.7245	40.2798	(72)
Total internal gains	333.5892	343.1109	328.4713	319.4119	303.4936	293.7288	282.9452	282.4828	290.7626	299.0687	315.8905	326.2193	(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	
South	9.3400				46.7521		0.6300		0.7000		0.7700		133.4503 (78)	
Solar gains	133.4503	218.5572	278.4031	314.6559	327.8909	315.5504	308.3119	299.4136	290.8249	235.7344	158.1841	115.3133	(83)	
Total gains	467.0395	561.6681	606.8744	634.0678	631.3845	609.2792	591.2572	581.8964	581.5875	534.8031	474.0746	441.5326	(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	70.4390	70.6531	70.8641	71.8726	72.0645	72.9714	72.9714	73.1419	72.6194	72.0645	71.6774	71.2771	
alpha	5.6959	5.7102	5.7243	5.7915	5.8043	5.8648	5.8648	5.8761	5.8413	5.8043	5.7785	5.7518	
util living area	0.9757	0.9394	0.8848	0.7798	0.6384	0.4619	0.3289	0.3484	0.5213	0.7883	0.9426	0.9812	(86)
MIT	20.2640	20.5054	20.7060	20.8832	20.9678	20.9959	20.9995	20.9993	20.9916	20.8944	20.5728	20.2195	(87)
Th 2	20.2215	20.2237	20.2258	20.2359	20.2378	20.2466	20.2466	20.2482	20.2432	20.2378	20.2340	20.2300	(88)
util rest of house	0.9701	0.9272	0.8637	0.7456	0.5922	0.4087	0.2727	0.2917	0.4665	0.7487	0.9289	0.9768	(89)
MIT 2	19.5641	19.7972	19.9853	20.1492	20.2175	20.2447	20.2464	20.2480	20.2390	20.1631	19.8735	19.5279	(90)
Living area fraction	19.9014	20.1385	20.3326	20.5029	20.5791	20.6067	20.6094	20.6101	20.6017	20.5155	20.2105	19.8612	(91)
MIT	19.9014	20.1385	20.3326	20.5029	20.5791	20.6067	20.6094	20.6101	20.6017	20.5155	20.2105	19.8612	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9014	20.1385	20.3326	20.5029	20.5791	20.6067	20.6094	20.6101	20.6017	20.5155	20.2105	19.8612	(93)

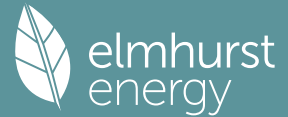
8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	451.8367	519.9439	526.0266	480.6264	387.1956	264.5529	177.2498	185.6466	286.5333	408.4350	440.1229	430.1567	(94)
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	(95)
Heat loss rate W	714.9475	696.2006	630.0875	521.1068	397.7138	265.7100	177.3562	185.8010	288.9998	444.1360	590.4204	709.2485	(97)
Space heating kWh	195.7544	118.4445	77.4213	29.1459	7.8256	0.0000	0.0000	0.0000	0.0000	26.5615	108.2142	207.6443	(98a)
Space heating requirement - total per year (kWh/year)												771.0118	
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	195.7544	118.4445	77.4213	29.1459	7.8256	0.0000	0.0000	0.0000	0.0000	26.5615	108.2142	207.6443	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												771.0118	
Space heating per m2										(98c) / (4) =		14.0798	(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	415.8130	327.3421	335.4057	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9776	0.9917	0.9901	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	406.4868	324.6392	332.0848	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	680.3171	660.9551	651.6282	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	197.1578	250.2190	237.7403	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	49.2895	62.5548	59.4351	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												171.2793	(107)
Energy for space heating												14.0798	(99)
Energy for space cooling												3.1278	(108)
Total												17.2077	(109)
Fabric Energy Efficiency (TFEE)												17.2	(109)

Full SAP Calculation Printout



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

1. Overall dwelling characteristics

Main dwelling	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	54.7600 (1b)	x 2.8000 (2b)	= 153.3280 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	54.7600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 153.3280 (5)

2. Ventilation rate

	m ³ 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	1 * 10 = 10.0000 (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) =	10.0000 / (5) = 0.0652 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.5000 (17)
Infiltration rate	0.2902 (18)
Number of sides sheltered	3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.2249 (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	0.2868	0.2812	0.2755	0.2474	0.2418	0.2137	0.2137	0.2081	0.2249	0.2418	0.2530	0.2643 (22b)
Effective ac	0.5411	0.5395	0.5380	0.5306	0.5292	0.5228	0.5228	0.5216	0.5253	0.5292	0.5320	0.5349 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
GLAZING			9.3400	1.3258	12.3826		(27)
External Wall 1	44.1000	9.3400	34.7600	0.1200	4.1712	190.0000	6604.4000 (29a)
Total net area of external elements A _{um} (A, m ²)			44.1000				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 16.5538		(33)
Main dwelling							
Party Wall 1			37.3300	0.0000	0.0000	20.0000	746.6000 (32)
Party Floor 1			54.7600			40.0000	2190.4000 (32d)
Party Ceiling 1			54.7600			30.0000	1642.8000 (32b)
Internal Wall 1			48.4800			9.0000	436.3200 (32c)
Heat capacity C _m = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) = 11620.5200	(34)
Thermal mass parameter (TMP = C _m / TFA) in kJ/m ² K							212.2082 (35)
List of Thermal Bridges							
K1 Element					Length	Psi-value	Total
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							0.0000 (36)
Point Thermal bridges							(36a) = 0.0000
Total fabric heat loss							(33) + (36) + (36a) = 16.5538 (37)

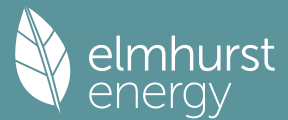
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	27.3797	27.2989	27.2197	26.8478	26.7782	26.4542	26.4542	26.3942	26.5790	26.7782	26.9189	27.0661 (38)
Average = Sum(39)m / 12 =	43.9335	43.8527	43.7735	43.4015	43.3319	43.0080	43.0080	42.9480	43.1328	43.3319	43.4727	43.6199 (39)
												43.4012

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.8023	0.8008	0.7994	0.7926	0.7913	0.7854	0.7854	0.7843	0.7877	0.7913	0.7939	0.7966 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.8303 (42)
Hot water usage for mixer showers												0.0000 (42a)
Hot water usage for baths	63.2632	62.3237	61.0006	58.5611	56.7344	54.7089	53.6148	54.9287	56.3592	58.5265	61.0163	63.0494 (42b)
Hot water usage for other uses	33.3743	32.1607	30.9471	29.7335	28.5199	27.3063	27.3063	28.5199	29.7335	30.9471	32.1607	33.3743 (42c)
Average daily hot water use (litres/day)												88.9953 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	96.6376	94.4844	91.9477	88.2946	85.2543	82.0152	80.9211	83.4486	86.0927	89.4737	93.1770	96.4237 (44)
Energy content (annual)	153.0503	134.5446	141.3203	120.8709	114.7687	100.8472	97.8671	103.3267	106.1609	121.4149	132.7478	150.9762 (45)
Distribution loss (46)m = 0.15 x (45)m												1477.8956

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	22.9575	20.1817	21.1980	18.1306	17.2153	15.1271	14.6801	15.4990	15.9241	18.2122	19.9122	22.6464 (46)
Water storage loss (or HIU loss):												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6900 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.9126 (55)
Total storage loss												
	28.2906	25.5528	28.2906	27.3780	28.2906	27.3780	28.2906	28.2906	27.3780	28.2906	27.3780	28.2906 (56)
If cylinder contains dedicated solar storage												
	28.2906	25.5528	28.2906	27.3780	28.2906	27.3780	28.2906	28.2906	27.3780	28.2906	27.3780	28.2906 (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												
	204.6033	181.1086	192.8733	170.7609	166.3217	150.7372	149.4201	154.8797	156.0509	172.9679	182.6378	202.5292 (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												
	204.6033	181.1086	192.8733	170.7609	166.3217	150.7372	149.4201	154.8797	156.0509	172.9679	182.6378	202.5292 (64)
												2084.8906 (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)
												0.0000 (64a)
Heat gains from water heating, kWh/month												
	92.1316	81.9873	88.2314	80.1016	79.4030	73.4437	73.7832	75.5985	75.2105	81.6129	84.0506	91.4420 (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	109.8194	109.8194	109.8194	109.8194	109.8194	109.8194	109.8194	109.8194	109.8194	109.8194	109.8194	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	37.2057	33.0458	26.8746	20.3458	15.2087	12.8399	13.8739	18.0339	24.2050	30.7338	35.8709	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	238.1595	240.6309	234.4032	221.1451	204.4091	188.6797	178.1715	175.7001	181.9278	195.1859	211.9219	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	47.8123	47.8123	47.8123	47.8123	47.8123	47.8123	47.8123	47.8123	47.8123	47.8123	47.8123	(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	(70)
Losses e.g. evaporation (negative values) (Table 5)												
	-73.2130	-73.2130	-73.2130	-73.2130	-73.2130	-73.2130	-73.2130	-73.2130	-73.2130	-73.2130	-73.2130	(71)
Water heating gains (Table 5)												
	123.8328	122.0049	118.5906	111.2522	106.7244	102.0052	99.1710	101.6109	104.4590	109.6947	116.7370	(72)
Total internal gains	483.6169	480.1003	464.2871	437.1618	410.7611	387.9435	375.6351	379.7637	395.0106	420.0332	448.9485	(73)

6. Solar gains

[Jan]												
	Area	Solar flux	g	FF	Access	Gains						
	m2	Table 6a	Specific data	Specific data	factor	W						
		W/m2	or Table 6b	or Table 6c	Table 6d							
South	9.3400	46.7521	0.6300	0.7000	0.7700	133.4503 (78)						
Solar gains	133.4503	218.5572	278.4031	314.6559	327.8909	315.5504	308.3119	299.4136	290.8249	235.7344	158.1841	115.3133 (83)
Total gains	617.0671	698.6575	742.6902	751.8178	738.6520	703.4939	683.9470	679.1773	685.8355	655.7676	607.1326	588.5291 (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	73.4730	73.6083	73.7415	74.3735	74.4929	75.0540	75.0540	75.1589	74.8369	74.4929	74.2517	74.0011
alpha	5.8982	5.9072	5.9161	5.9582	5.9662	6.0036	6.0036	6.0106	5.9891	5.9662	5.9501	5.9334
util living area												
	0.9179	0.8597	0.7806	0.6715	0.5388	0.3904	0.2766	0.2908	0.4323	0.6625	0.8541	0.9314 (86)
Living	20.5992	20.7474	20.8682	20.9512	20.9880	20.9986	20.9999	20.9998	20.9973	20.9610	20.7942	20.5571
Non living	19.8108	19.9847	20.1216	20.2151	20.2515	20.2652	20.2660	20.2669	20.2623	20.2273	20.0478	19.7650
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	20.7950	20.7474	20.8682	20.9512	20.9880	20.9986	20.9999	20.9998	20.9973	20.9610	20.7942	20.6190 (87)
Th 2	20.2513	20.2526	20.2539	20.2598	20.2609	20.2660	20.2660	20.2670	20.2640	20.2609	20.2586	20.2563 (88)
util rest of house												
	0.9035	0.8389	0.7528	0.6365	0.4981	0.3460	0.2305	0.2445	0.3868	0.6218	0.8294	0.9188 (89)
MIT 2	20.0757	19.9847	20.1216	20.2151	20.2515	20.2652	20.2660	20.2669	20.2623	20.2273	20.0478	19.8536 (90)
Living area fraction												
MIT	20.4223	20.3522	20.4814	20.5698	20.6064	20.6186	20.6196	20.6201	20.6165	20.5809	20.4075	20.2224 (92)
Temperature adjustment												0.0000
adjusted MIT	20.4223	20.3522	20.4814	20.5698	20.6064	20.6186	20.6196	20.6201	20.6165	20.5809	20.4075	20.2224 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9069	0.8418	0.7615	0.6514	0.5172	0.3674	0.2527	0.2668	0.4087	0.6397	0.8347	0.9182	(94)
Useful gains	559.6473	588.1517	565.5617	489.7054	382.0573	258.4430	172.8429	181.1970	280.2794	419.4869	506.7441	540.3894	(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													
	708.3104	677.6225	612.0158	506.4875	385.9317	258.8479	172.8764	181.2444	281.0746	432.4929	578.5141	698.8976	(97)
Space heating kWh													
	110.6053	60.1244	34.5619	12.0831	2.8825	0.0000	0.0000	0.0000	0.0000	9.6764	51.6744	117.9301	(98a)
Space heating requirement - total per year (kWh/year)												399.5381	
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													

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110.6053	60.1244	34.5619	12.0831	2.8825	0.0000	0.0000	0.0000	0.0000	9.6764	51.6744	117.9301 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)											399.5381
Space heating per m2											(98c) / (4) = 7.2962 (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 %)												253.3058 (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	110.6053	60.1244	34.5619	12.0831	2.8825	0.0000	0.0000	0.0000	0.0000	9.6764	51.6744	117.9301 (98)
Space heating efficiency (main heating system 1)	253.3058	253.3058	253.3058	253.3058	253.3058	0.0000	0.0000	0.0000	0.0000	253.3058	253.3058	253.3058 (210)
Space heating fuel (main heating system)	43.6647	23.7359	13.6443	4.7702	1.1380	0.0000	0.0000	0.0000	0.0000	3.8201	20.4000	46.5564 (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	204.6033	181.1086	192.8733	170.7609	166.3217	150.7372	149.4201	154.8797	156.0509	172.9679	182.6378	202.5292 (64)
Efficiency of water heater (217)m	155.6147	155.6147	155.6147	155.6147	155.6147	155.6147	155.6147	155.6147	155.6147	155.6147	155.6147	155.6147 (216)
Fuel for water heating, kWh/month	131.4807	116.3827	123.9428	109.7331	106.8804	96.8657	96.0193	99.5277	100.2803	111.1514	117.3654	130.1479 (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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	32.5659	26.1256	23.5232	17.2341	13.3121	10.8761	12.1438	15.7849	20.5031	26.9011	30.3848	33.4711 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-87.1197	-122.7037	-171.0099	-182.9374	-190.2825	-174.9293	-173.3928	-169.2637	-157.1059	-137.9530	-96.0919	-75.3651 (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	-19.2109	-48.6912	-106.5646	-171.0796	-233.5238	-236.6953	-234.8862	-196.0949	-141.6736	-77.0910	-28.7991	-14.4696 (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												157.7295 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												155.6147
Water heating fuel used												1339.7774 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
Total electricity for the above, kWh/year												0.0000 (231)
Electricity for lighting (calculated in Appendix L)												262.8259 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-3246.9343 (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												-1486.6015 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	157.7295	16.4900	26.0096 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1339.7774	16.4900	220.9293 (247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000 (247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (249)
Energy for lighting	262.8259	16.4900	43.3400 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1738.1547	16.4900	-286.6217
PV Unit electricity exported	-1508.7796	5.5900	-84.3408
Total			-370.9625 (252)
Total energy cost			-80.6836 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):												0.3600 (256)
Energy cost factor (ECF)												-0.2912 (257)
SAP value												104.7197
SAP rating (Section 12)												105 (258)
SAP band												A

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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	157.7295	0.1586	25.0236 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1339.7774	0.1407	188.5321 (264)
Space and water heating			213.5557 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	262.8259	0.1443	37.9339 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1738.1547	0.1353	-235.1935
PV Unit electricity exported	-1508.7796	0.1238	-186.8415
Total			-422.0350 (269)
Total CO2, kg/year			-170.5453 (272)
CO2 emissions per m2			-3.1100 (273)
EI value			102.2908
EI rating			102 (274)
EI band			A

SAP 10 WORKSHEET FOR New Build (As Designed) (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	54.7600 (1b)	2.8000 (2b)	153.3280 (1b) - (3b)
Ground floor			(4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	54.7600		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 153.3280 (5)
Dwelling volume			

2. Ventilation rate

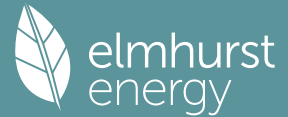
	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	1 * 10 = 10.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	10.0000 / (5) = 0.0652 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.5000 (17)
Infiltration rate	0.2902 (18)
Number of sides sheltered	3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.2249 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.3000	4.3000	4.3000	3.9000	4.0000	3.4000	3.3000	3.3000	3.4000	3.9000	3.9000	3.9000 (22)
Wind factor	1.0750	1.0750	1.0750	0.9750	1.0000	0.8500	0.8250	0.8250	0.8500	0.9750	0.9750	0.9750 (22a)
Adj infilt rate	0.2418	0.2418	0.2418	0.2193	0.2249	0.1912	0.1856	0.1856	0.1912	0.2193	0.2193	0.2193 (22b)
Effective ac	0.5292	0.5292	0.5292	0.5240	0.5253	0.5183	0.5172	0.5172	0.5183	0.5240	0.5240	0.5240 (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				
GLAZING				9.3400	1.3258	12.3826		(27)				
External Wall 1	44.1000		9.3400	34.7600	0.1200	4.1712	190.0000	6604.4000 (29a)				
Total net area of external elements Aum(A, m2)				44.1000				(31)				
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =		16.5538		(33)				
Main dwelling												
Party Wall 1				37.3300	0.0000	0.0000	20.0000	746.6000 (32)				
Party Floor 1				54.7600			40.0000	2190.4000 (32d)				
Party Ceiling 1				54.7600			30.0000	1642.8000 (32b)				
Internal Wall 1				48.4800			9.0000	436.3200 (32c)				
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =		11620.5200 (34)				
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								212.2082 (35)				
List of Thermal Bridges												
K1 Element					Length	Psi-value	Total					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								0.0000 (36)				
Point Thermal bridges							(36a) =	0.0000				
Total fabric heat loss						(33) + (36) + (36a) =		16.5538 (37)				
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	26.7782	26.7782	26.7782	26.5158	26.5790	26.2238	26.1702	26.1702	26.2238	26.5158	26.5158	26.5158 (38)

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Heat transfer coeff	43.3319	43.3319	43.3319	43.0696	43.1328	42.7776	42.7240	42.7240	42.7776	43.0696	43.0696	43.0696 (39)
Average = Sum(39)m / 12 =												43.0342
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.7913	0.7913	0.7913	0.7865	0.7877	0.7812	0.7802	0.7802	0.7812	0.7865	0.7865	0.7865 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.8303 (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												
63.2632	62.3237	61.0006	58.5611	56.7344	54.7089	53.6148	54.9287	56.3592	58.5265	61.0163	63.0494	(42b)
Hot water usage for other uses												
33.3743	32.1607	30.9471	29.7335	28.5199	27.3063	27.3063	28.5199	29.7335	30.9471	32.1607	33.3743	(42c)
Average daily hot water use (litres/day)												88.9953 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	96.6376	94.4844	91.9477	88.2946	85.2543	82.0152	80.9211	83.4486	86.0927	89.4737	93.1770	96.4237 (44)
Energy conte	153.0503	134.5446	141.3203	120.8709	114.7687	100.8472	97.8671	103.3267	106.1609	121.4149	132.7478	150.9762 (45)
Energy content (annual)										Total = Sum(45)m =		1477.8956
Distribution loss (46)m = 0.15 x (45)m												
22.9575	20.1817	21.1980	18.1306	17.2153	15.1271	14.6801	15.4990	15.9241	18.2122	19.9122	22.6464	(46)
Water storage loss (or HIU loss):												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6900 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.9126 (55)
Total storage loss												
28.2906	25.5528	28.2906	27.3780	28.2906	27.3780	28.2906	28.2906	27.3780	28.2906	27.3780	28.2906	(56)
If cylinder contains dedicated solar storage												
28.2906	25.5528	28.2906	27.3780	28.2906	27.3780	28.2906	28.2906	27.3780	28.2906	27.3780	28.2906	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	(58)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Total heat required for water heating calculated for each month												
204.6033	181.1086	192.8733	170.7609	166.3217	150.7372	149.4201	154.8797	156.0509	172.9679	182.6378	202.5292	(62)
WWHRS	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	(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	(63c)
FGHRS	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												
204.6033	181.1086	192.8733	170.7609	166.3217	150.7372	149.4201	154.8797	156.0509	172.9679	182.6378	202.5292	(64)
Total per year (kWh/year) = Sum(64)m =												2084.8906 (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												
92.1316	81.9873	88.2314	80.1016	79.4030	73.4437	73.7832	75.5985	75.2105	81.6129	84.0506	91.4420	(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	109.8194	109.8194	109.8194	109.8194	109.8194	109.8194	109.8194	109.8194	109.8194	109.8194	109.8194	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
37.2057	33.0458	26.8746	20.3458	15.2087	12.8399	13.8739	18.0339	24.2050	30.7338	35.8709	38.2398	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
238.1595	240.6309	234.4032	221.1451	204.4091	188.6797	178.1715	175.7001	181.9278	195.1859	211.9219	227.6513	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
47.8123	47.8123	47.8123	47.8123	47.8123	47.8123	47.8123	47.8123	47.8123	47.8123	47.8123	47.8123	(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	(70)
Losses e.g. evaporation (negative values) (Table 5)												
-73.2130	-73.2130	-73.2130	-73.2130	-73.2130	-73.2130	-73.2130	-73.2130	-73.2130	-73.2130	-73.2130	-73.2130	(71)
Water heating gains (Table 5)												
123.8328	122.0049	118.5906	111.2522	106.7244	102.0052	99.1710	101.6109	104.4590	109.6947	116.7370	122.9059	(72)
Total internal gains												
483.6169	480.1003	464.2871	437.1618	410.7611	387.9435	375.6351	379.7637	395.0106	420.0332	448.9485	473.2158	(73)

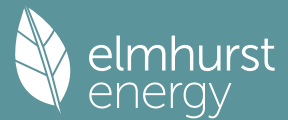
6. Solar gains

[Jan]												
	Area	Solar flux	g	FF	Access	Gains						
	m2	Table 6a	Specific data	Specific data	factor	W						
		W/m2	or Table 6b	or Table 6c	Table 6d							
South	9.3400	39.5594	0.6300	0.7000	0.7700	112.9195	(78)					
Solar gains	112.9195	194.2730	261.0029	304.1674	307.3977	301.3506	288.7366	276.5285	280.7092	225.0192	143.8037	104.3311 (83)
Total gains	596.5363	674.3733	725.2900	741.3292	718.1588	689.2941	664.3717	656.2921	675.7198	645.0524	592.7522	577.5469 (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	74.4929	74.4929	74.4929	74.9467	74.8369	75.4582	75.5529	75.5529	75.4582	74.9467	74.9467	74.9467
alpha	5.9662	5.9662	5.9662	5.9964	5.9891	6.0305	6.0369	6.0369	6.0305	5.9964	5.9964	5.9964
util living area												
	0.9123	0.8519	0.7664	0.6423	0.4946	0.3471	0.2572	0.2733	0.4103	0.6412	0.8420	0.9227 (86)
Living	20.6420	20.7771	20.8885	20.9643	20.9933	20.9994	20.9999	20.9999	20.9981	20.9693	20.8228	20.6141
Non living	19.8713	20.0274	20.1508	20.2334	20.2591	20.2693	20.2705	20.2705	20.2686	20.2394	20.0864	19.8420
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

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16 / 9	28	0	0	0	0	0	0	0	0	0	0	10
MIT	20.8168	20.7771	20.8885	20.9643	20.9933	20.9994	20.9999	20.9999	20.9981	20.9693	20.8228	20.6680 (87)
Th 2	20.2609	20.2609	20.2609	20.2650	20.2640	20.2697	20.2705	20.2705	20.2697	20.2650	20.2650	20.2650 (88)
util rest of house	0.8966	0.8297	0.7370	0.6058	0.4521	0.3021	0.2103	0.2259	0.3647	0.5990	0.8153	0.9084 (89)
MIT 2	20.1056	20.0274	20.1508	20.2334	20.2591	20.2693	20.2705	20.2705	20.2686	20.2394	20.0864	19.9183 (90)
Living area fraction									fLA = Living area / (4) =			0.4819 (91)
MIT	20.4484	20.3887	20.5063	20.5856	20.6129	20.6212	20.6220	20.6220	20.6202	20.5911	20.4413	20.2796 (92)
Temperature adjustment												0.0000
adjusted MIT	20.4484	20.3887	20.5063	20.5856	20.6129	20.6212	20.6220	20.6220	20.6202	20.5911	20.4413	20.2796 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9008	0.8337	0.7471	0.6219	0.4723	0.3238	0.2329	0.2488	0.3867	0.6180	0.8220	0.9087 (94)
Useful gains	537.3849	562.2280	541.8342	461.0346	339.2148	223.1794	154.7291	163.2630	261.2779	398.6485	487.2506	524.8172 (95)
Ext temp.	5.0000	5.6000	7.1000	9.6000	12.7000	15.4000	17.0000	16.8000	14.5000	11.1000	7.7000	4.9000 (96)
Heat loss rate W	669.4070	640.8223	580.9206	473.1460	341.3068	223.3483	154.7471	163.2907	261.8055	408.7783	548.7609	662.3923 (97)
Space heating kWh	98.2244	52.8153	29.0803	8.7202	1.5564	0.0000	0.0000	0.0000	0.0000	7.5366	44.2874	102.3559 (98a)
Space heating requirement - total per year (kWh/year)												344.5766
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	98.2244	52.8153	29.0803	8.7202	1.5564	0.0000	0.0000	0.0000	0.0000	7.5366	44.2874	102.3559 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												344.5766
Space heating per m2										(98c) / (4) =		6.2925 (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 %)												249.1829 (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	98.2244	52.8153	29.0803	8.7202	1.5564	0.0000	0.0000	0.0000	0.0000	7.5366	44.2874	102.3559 (98)
Space heating efficiency (main heating system 1)	249.1829	249.1829	249.1829	249.1829	249.1829	0.0000	0.0000	0.0000	0.0000	249.1829	249.1829	249.1829 (210)
Space heating fuel (main heating system)	39.4186	21.1954	11.6703	3.4995	0.6246	0.0000	0.0000	0.0000	0.0000	3.0245	17.7731	41.0766 (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	204.6033	181.1086	192.8733	170.7609	166.3217	150.7372	149.4201	154.8797	156.0509	172.9679	182.6378	202.5292 (64)
Efficiency of water heater (217)m	153.1908	153.1908	153.1908	153.1908	153.1908	153.1908	153.1908	153.1908	153.1908	153.1908	153.1908	153.1908 (216)
Fuel for water heating, kWh/month	133.5611	118.2242	125.9040	111.4694	108.5716	98.3984	97.5386	101.1025	101.8670	112.9101	119.2224	132.2072 (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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	32.5659	26.1256	23.5232	17.2341	13.3121	10.8761	12.1438	15.7849	20.5031	26.9011	30.3848	33.4711 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-75.5503	-112.3974	-164.3440	-180.1893	-186.3200	-173.0825	-170.4404	-164.6269	-154.9001	-134.0206	-89.0423	-69.0516 (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	-14.4217	-39.9536	-95.8822	-162.0272	-210.9984	-220.0190	-211.9161	-172.8062	-133.4870	-71.2487	-24.4949	-12.2274 (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												138.2826 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												153.1908
Water heating fuel used												1360.9767 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
Total electricity for the above, kWh/year												0.0000 (231)
Electricity for lighting (calculated in Appendix L)												262.8259 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-3043.4475 (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												-1281.3623 (238)

10a. Fuel costs - using BEDF prices (590)

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	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	138.2826	28.4300	39.3137 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1360.9767	28.4300	386.9257 (247)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000 (247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (249)
Energy for lighting	262.8259	28.4300	74.7214 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1673.9652	28.4300	-475.9083
PV Unit electricity exported	-1369.4822	5.8100	-79.5669
Total			-555.4752 (252)
Total energy cost			-54.5144 (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	138.2826	0.1589	21.9755 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1360.9767	0.1407	191.5152 (264)
Space and water heating			213.4907 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	262.8259	0.1443	37.9339 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1673.9652	0.1349	-225.7566
PV Unit electricity exported	-1369.4822	0.1235	-169.1597
Total			-394.9164 (269)
Total CO2, kg/year			-143.4918 (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	138.2826	1.5882	219.6211 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1360.9767	1.5203	2069.1182 (278)
Space and water heating			2288.7393 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	262.8259	1.5338	403.1311 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1673.9652	1.4985	-2508.3738
PV Unit electricity exported	-1369.4822	0.4534	-620.9648
Total			-3129.3386 (283)
Total Primary energy kWh/year			-437.4682 (286)

SAP 10 EPC IMPROVEMENTS

1 BED

Current energy efficiency rating: A 105
Current environmental impact rating: A 102

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: A 105
Potential environmental impact rating: A 102

Fuel prices for cost data on this page from database revision number 590 TEST (30 Jan 2026)
Recommendation texts revision number 6.1 (11 Jun 2019)

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

Electricity	Current £501	Potential £501	£0	Saving
Space heating	£39	£39	£0	
Water heating	£387	£387	£0	
Lighting	£75	£75	£0	
Generated (PV)	-£555	-£555	£0	
Total cost of fuels	-£54	-£54	£0	
Total cost of uses	-£54	-£54	£0	
Delivered energy	-23 kWh/m²	-23 kWh/m²	0 kWh/m²	
Carbon dioxide emissions	-0.1 tonnes	-0.1 tonnes	0.0 tonnes	
CO2 emissions per m²	-3 kg/m²	-3 kg/m²	0 kg/m²	
Primary energy	-8 kWh/m²	-8 kWh/m²	0 kWh/m²	

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling	54.7600 (1b)	x 2.8000 (2b)	= 153.3280 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	54.7600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 153.3280 (5)

2. Ventilation rate

	m ³ 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	1 * 10 = 10.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	10.0000 / (5) = 0.0652 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.5000 (17)
Infiltration rate	0.2902 (18)
Number of sides sheltered	3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.2249 (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	0.2868	0.2812	0.2755	0.2474	0.2418	0.2137	0.2137	0.2081	0.2249	0.2418	0.2530	0.2643 (22b)
Effective ac	0.5411	0.5395	0.5380	0.5306	0.5292	0.5228	0.5228	0.5216	0.5253	0.5292	0.5320	0.5349 (25)

3. Heat losses and heat loss parameter

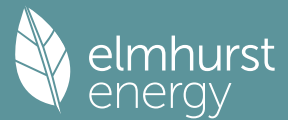
Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
GLAZING			9.3400	1.3258	12.3826		(27)
External Wall 1	44.1000	9.3400	34.7600	0.1200	4.1712	190.0000	6604.4000 (29a)
Total net area of external elements Aum(A, m ²)			44.1000				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		16.5538		(33)
Main dwelling							
Party Wall 1			37.3300	0.0000	0.0000	20.0000	746.6000 (32)
Party Floor 1			54.7600			40.0000	2190.4000 (32d)
Party Ceiling 1			54.7600			30.0000	1642.8000 (32b)
Internal Wall 1			48.4800			9.0000	436.3200 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	11620.5200 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							212.2082 (35)
List of Thermal Bridges							
Kl Element				Length	Psi-value	Total	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)						(36a) =	0.0000 (36)
Point Thermal bridges						(33) + (36) + (36a) =	16.5538 (37)
Total fabric heat loss							

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	27.3797	27.2989	27.2197	26.8478	26.7782	26.4542	26.4542	26.3942	26.5790	26.7782	26.9189	27.0661 (38)
Average = Sum(39)m / 12 =	43.9335	43.8527	43.7735	43.4015	43.3319	43.0080	43.0080	42.9480	43.1328	43.3319	43.4727	43.6199 (39)
												43.4012
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.8023	0.8008	0.7994	0.7926	0.7913	0.7854	0.7854	0.7843	0.7877	0.7913	0.7939	0.7966 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.8303 (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	63.2632	62.3237	61.0006	58.5611	56.7344	54.7089	53.6148	54.9287	56.3592	58.5265	61.0163	63.0494 (42b)
Hot water usage for other uses	33.3743	32.1607	30.9471	29.7335	28.5199	27.3063	27.3063	28.5199	29.7335	30.9471	32.1607	33.3743 (42c)
Average daily hot water use (litres/day)												88.9953 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

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Energy conte	96.6376	94.4844	91.9477	88.2946	85.2543	82.0152	80.9211	83.4486	86.0927	89.4737	93.1770	96.4237 (44)
Energy content (annual)	153.0503	134.5446	141.3203	120.8709	114.7687	100.8472	97.8671	103.3267	106.1609	121.4149	132.7478	150.9762 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		1477.8956
Water storage loss (or HIU loss):	22.9575	20.1817	21.1980	18.1306	17.2153	15.1271	14.6801	15.4990	15.9241	18.2122	19.9122	22.6464 (46)
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6900 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.9126 (55)
Total storage loss												
If cylinder contains dedicated solar storage	28.2906	25.5528	28.2906	27.3780	28.2906	27.3780	28.2906	28.2906	27.3780	28.2906	27.3780	28.2906 (56)
Primary loss	28.2906	25.5528	28.2906	27.3780	28.2906	27.3780	28.2906	28.2906	27.3780	28.2906	27.3780	28.2906 (57)
Combi 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)
Total heat required for water heating calculated for each month	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)
WWHRS	204.6033	181.1086	192.8733	170.7609	166.3217	150.7372	149.4201	154.8797	156.0509	172.9679	182.6378	202.5292 (62)
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 (63a)
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 (63b)
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 (63c)
Output from w/h	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)
Electric shower(s)	204.6033	181.1086	192.8733	170.7609	166.3217	150.7372	149.4201	154.8797	156.0509	172.9679	182.6378	202.5292 (64)
	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												2084.8906 (64)
	92.1316	81.9873	88.2314	80.1016	79.4030	73.4437	73.7832	75.5985	75.2105	81.6129	84.0506	91.4420 (65)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												

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	109.8194	109.8194	109.8194	109.8194	109.8194	109.8194	109.8194	109.8194	109.8194	109.8194	109.8194	109.8194 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	37.2057	33.0458	26.8746	20.3458	15.2087	12.8399	13.8739	18.0339	24.2050	30.7338	35.8709	38.2398 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	238.1595	240.6309	234.4032	221.1451	204.4091	188.6797	178.1715	175.7001	181.9278	195.1859	211.9219	227.6513 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	47.8123	47.8123	47.8123	47.8123	47.8123	47.8123	47.8123	47.8123	47.8123	47.8123	47.8123	47.8123 (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)	-73.2130	-73.2130	-73.2130	-73.2130	-73.2130	-73.2130	-73.2130	-73.2130	-73.2130	-73.2130	-73.2130	-73.2130 (71)
Water heating gains (Table 5)	123.8328	122.0049	118.5906	111.2522	106.7244	102.0052	99.1710	101.6109	104.4590	109.6947	116.7370	122.9059 (72)
Total internal gains	483.6169	480.1003	464.2871	437.1618	410.7611	387.9435	375.6351	379.7637	395.0106	420.0332	448.9485	473.2158 (73)

6. Solar gains

[Jan]												
				Area	Solar flux		g		FF	Access	Gains	
				m2	Table 6a		Specific data		Specific data	factor	W	
					W/m2		or Table 6b		or Table 6c	Table 6d		
South				9.3400	46.7521		0.6300		0.7000	0.7700	133.4503 (78)	
Solar gains	133.4503	218.5572	278.4031	314.6559	327.8909	315.5504	308.3119	299.4136	290.8249	235.7344	158.1841	115.3133 (83)
Total gains	617.0671	698.6575	742.6902	751.8178	738.6520	703.4939	683.9470	679.1773	685.8355	655.7676	607.1326	588.5291 (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	73.4730	73.6083	73.7415	74.3735	74.4929	75.0540	75.0540	75.1589	74.8369	74.4929	74.2517	74.0011
alpha	5.8982	5.9072	5.9161	5.9582	5.9662	6.0036	6.0036	6.0106	5.9891	5.9662	5.9501	5.9334
util living area	0.9179	0.8597	0.7806	0.6715	0.5388	0.3904	0.2766	0.2908	0.4323	0.6625	0.8541	0.9314 (86)
Living	20.5992	20.7474	20.8682	20.9512	20.9880	20.9986	20.9999	20.9998	20.9973	20.9610	20.7942	20.5571
Non living	19.8108	19.9847	20.1216	20.2151	20.2515	20.2652	20.2660	20.2669	20.2623	20.2273	20.0478	19.7650
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	20.7950	20.7474	20.8682	20.9512	20.9880	20.9986	20.9999	20.9998	20.9973	20.9610	20.7942	20.6190 (87)
Th 2	20.2513	20.2526	20.2539	20.2598	20.2609	20.2660	20.2660	20.2670	20.2640	20.2609	20.2586	20.2563 (88)
util rest of house	0.9035	0.8389	0.7528	0.6365	0.4981	0.3460	0.2305	0.2445	0.3868	0.6218	0.8294	0.9188 (89)
MIT 2	20.0757	19.9847	20.1216	20.2151	20.2515	20.2652	20.2660	20.2669	20.2623	20.2273	20.0478	19.8536 (90)
Living area fraction									fLA = Living area / (4) =			0.4819 (91)
MIT	20.4223	20.3522	20.4814	20.5698	20.6064	20.6186	20.6196	20.6201	20.6165	20.5809	20.4075	20.2224 (92)
Temperature adjustment												0.0000
adjusted MIT	20.4223	20.3522	20.4814	20.5698	20.6064	20.6186	20.6196	20.6201	20.6165	20.5809	20.4075	20.2224 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9069	0.8418	0.7615	0.6514	0.5172	0.3674	0.2527	0.2668	0.4087	0.6397	0.8347	0.9182 (94)
Ext temp.	559.6473	588.1517	565.5617	489.7054	382.0573	258.4430	172.8429	181.1970	280.2794	419.4869	506.7441	540.3894 (95)
Heat loss rate W	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)
Space heating kWh	708.3104	677.6225	612.0158	506.4875	385.9317	258.8479	172.8764	181.2444	281.0746	432.4929	578.5141	698.8976 (97)
Space heating requirement - total per year (kWh/year)	110.6053	60.1244	34.5619	12.0831	2.8825	0.0000	0.0000	0.0000	0.0000	9.6764	51.6744	117.9301 (98a)
												399.5381

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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	110.6053	60.1244	34.5619	12.0831	2.8825	0.0000	0.0000	0.0000	0.0000	9.6764	51.6744	117.9301 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												399.5381
Space heating per m2										(98c) / (4) =		7.2962 (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 %)												253.3058 (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	110.6053	60.1244	34.5619	12.0831	2.8825	0.0000	0.0000	0.0000	0.0000	9.6764	51.6744	117.9301 (98)
Space heating efficiency (main heating system 1)	253.3058	253.3058	253.3058	253.3058	253.3058	0.0000	0.0000	0.0000	0.0000	253.3058	253.3058	253.3058 (210)
Space heating fuel (main heating system)	43.6647	23.7359	13.6443	4.7702	1.1380	0.0000	0.0000	0.0000	0.0000	3.8201	20.4000	46.5564 (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	204.6033	181.1086	192.8733	170.7609	166.3217	150.7372	149.4201	154.8797	156.0509	172.9679	182.6378	202.5292 (64)
Efficiency of water heater (217)m	155.6147	155.6147	155.6147	155.6147	155.6147	155.6147	155.6147	155.6147	155.6147	155.6147	155.6147	155.6147 (216)
Fuel for water heating, kWh/month	131.4807	116.3827	123.9428	109.7331	106.8804	96.8657	96.0193	99.5277	100.2803	111.1514	117.3654	130.1479 (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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	32.5659	26.1256	23.5232	17.2341	13.3121	10.8761	12.1438	15.7849	20.5031	26.9011	30.3848	33.4711 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-87.1197	-122.7037	-171.0099	-182.9374	-190.2825	-174.9293	-173.3928	-169.2637	-157.1059	-137.9530	-96.0919	-75.3651 (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	-19.2109	-48.6912	-106.5646	-171.0796	-233.5238	-236.6953	-234.8862	-196.0949	-141.6736	-77.0910	-28.7991	-14.4696 (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												157.7295 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												155.6147
Water heating fuel used												1339.7774 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
Total electricity for the above, kWh/year												0.0000 (231)
Electricity for lighting (calculated in Appendix L)												262.8259 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-3246.9343 (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												-1486.6015 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	157.7295	16.4900	26.0096 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1339.7774	16.4900	220.9293 (247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000 (247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (249)
Energy for lighting	262.8259	16.4900	43.3400 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1738.1547	16.4900	-286.6217
PV Unit electricity exported	-1508.7796	5.5900	-84.3408
Total			-370.9625 (252)
Total energy cost			-80.6836 (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] =	-0.2912 (257)
SAP value		104.7197

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SAP rating (Section 12)
SAP band

105 (258)
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	157.7295	0.1586	25.0236	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1339.7774	0.1407	188.5321	(264)
Space and water heating			213.5557	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	262.8259	0.1443	37.9339	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1738.1547	0.1353	-235.1935	
PV Unit electricity exported	-1508.7796	0.1238	-186.8415	
Total			-422.0350	(269)
Total CO2, kg/year			-170.5453	(272)
CO2 emissions per m2			-3.1100	(273)
EI value			102.2908	
EI rating			102	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (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	54.7600	2.8000	153.3280	(1b) - (3b)
Ground floor				
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	54.7600			(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	153.3280	(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	1 * 10 =	10.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	10.0000 / (5) =	0.0652 (8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		4.5000	(17)
Infiltration rate		0.2902	(18)
Number of sides sheltered		3	(19)

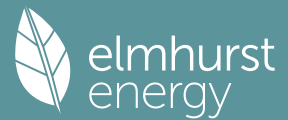
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2249	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.3000	4.3000	3.9000	4.0000	3.4000	3.3000	3.3000	3.4000	3.9000	3.9000	3.9000	(22)
Wind factor	1.0750	1.0750	1.0750	0.9750	1.0000	0.8500	0.8250	0.8250	0.8500	0.9750	0.9750	0.9750	(22a)
Adj infilt rate	0.2418	0.2418	0.2418	0.2193	0.2249	0.1912	0.1856	0.1856	0.1912	0.2193	0.2193	0.2193	(22b)
Effective ac	0.5292	0.5292	0.5292	0.5240	0.5253	0.5183	0.5172	0.5172	0.5183	0.5240	0.5240	0.5240	(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								
GLAZING			9.3400	1.3258	12.3826			(27)
External Wall 1	44.1000	9.3400	34.7600	0.1200	4.1712	190.0000	6604.4000	(29a)
Total net area of external elements Aum(A, m2)			44.1000					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	16.5538		(33)
Main dwelling								
Party Wall 1			37.3300	0.0000	0.0000	20.0000	746.6000	(32)
Party Floor 1			54.7600			40.0000	2190.4000	(32d)
Party Ceiling 1			54.7600			30.0000	1642.8000	(32b)
Internal Wall 1			48.4800			9.0000	436.3200	(32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	11620.5200	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							212.2082	(35)
List of Thermal Bridges								
K1 Element					Length	Psi-value	Total	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							0.0000	(36)
Point Thermal bridges							(36a) =	0.0000
Total fabric heat loss							(33) + (36) + (36a) =	16.5538 (37)

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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	26.7782	26.7782	26.7782	26.5158	26.5790	26.2238	26.1702	26.1702	26.2238	26.5158	26.5158	26.5158	(38)
Heat transfer coeff	43.3319	43.3319	43.3319	43.0696	43.1328	42.7776	42.7240	42.7240	42.7776	43.0696	43.0696	43.0696	(39)
Average = Sum(39)m / 12 =												43.0342	
HLP	0.7913	0.7913	0.7913	0.7865	0.7877	0.7812	0.7802	0.7802	0.7812	0.7865	0.7865	0.7865	(40)
HLP (average)												0.7859	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.8303 (42)
Hot water usage for mixer showers													(42a)
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	
Hot water usage for baths													(42b)
63.2632	62.3237	61.0006	58.5611	56.7344	54.7089	53.6148	54.9287	56.3592	58.5265	61.0163	63.0494	63.0494	
Hot water usage for other uses													(42c)
33.3743	32.1607	30.9471	29.7335	28.5199	27.3063	27.3063	28.5199	29.7335	30.9471	32.1607	33.3743	33.3743	
Average daily hot water use (litres/day)												88.9953	(43)
Daily hot water use													
96.6376	94.4844	91.9477	88.2946	85.2543	82.0152	80.9211	83.4486	86.0927	89.4737	93.1770	96.4237	96.4237	(44)
Energy conte	153.0503	134.5446	141.3203	120.8709	114.7687	100.8472	97.8671	103.3267	106.1609	121.4149	132.7478	150.9762	(45)
Energy content (annual)												1477.8956	
Distribution loss (46)m = 0.15 x (45)m													
22.9575	20.1817	21.1980	18.1306	17.2153	15.1271	14.6801	15.4990	15.9241	18.2122	19.9122	22.6464	22.6464	(46)
Water storage loss (or HIU loss):													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6900	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.9126	(55)
Total storage loss													
28.2906	25.5528	28.2906	27.3780	28.2906	27.3780	28.2906	28.2906	27.3780	28.2906	27.3780	28.2906	28.2906	(56)
If cylinder contains dedicated solar storage													
28.2906	25.5528	28.2906	27.3780	28.2906	27.3780	28.2906	28.2906	27.3780	28.2906	27.3780	28.2906	28.2906	(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													
204.6033	181.1086	192.8733	170.7609	166.3217	150.7372	149.4201	154.8797	156.0509	172.9679	182.6378	202.5292	202.5292	(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													
204.6033	181.1086	192.8733	170.7609	166.3217	150.7372	149.4201	154.8797	156.0509	172.9679	182.6378	202.5292	202.5292	(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													
92.1316	81.9873	88.2314	80.1016	79.4030	73.4437	73.7832	75.5985	75.2105	81.6129	84.0506	91.4420	91.4420	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	109.8194	109.8194	109.8194	109.8194	109.8194	109.8194	109.8194	109.8194	109.8194	109.8194	109.8194	109.8194	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
37.2057	33.0458	26.8746	20.3458	15.2087	12.8399	13.8739	18.0339	24.2050	30.7338	35.8709	38.2398	38.2398	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
238.1595	240.6309	234.4032	221.1451	204.4091	188.6797	178.1715	175.7001	181.9278	195.1859	211.9219	227.6513	227.6513	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
47.8123	47.8123	47.8123	47.8123	47.8123	47.8123	47.8123	47.8123	47.8123	47.8123	47.8123	47.8123	47.8123	(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)													
-73.2130	-73.2130	-73.2130	-73.2130	-73.2130	-73.2130	-73.2130	-73.2130	-73.2130	-73.2130	-73.2130	-73.2130	-73.2130	(71)
Water heating gains (Table 5)													
123.8328	122.0049	118.5906	111.2522	106.7244	102.0052	99.1710	101.6109	104.4590	109.6947	116.7370	122.9059	122.9059	(72)
Total internal gains													
483.6169	480.1003	464.2871	437.1618	410.7611	387.9435	375.6351	379.7637	395.0106	420.0332	448.9485	473.2158	473.2158	(73)

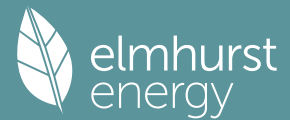
6. Solar gains

[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
South				9.3400	39.5594	0.6300	0.7000		0.7700			112.9195 (78)
Solar gains	112.9195	194.2730	261.0029	304.1674	307.3977	301.3506	288.7366	276.5285	280.7092	225.0192	143.8037	104.3311 (83)
Total gains	596.5363	674.3733	725.2900	741.3292	718.1588	689.2941	664.3717	656.2921	675.7198	645.0524	592.7522	577.5469 (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)													
tau	74.4929	74.4929	74.4929	74.4929	74.4929	74.4929	74.4929	74.4929	74.4929	74.4929	74.4929	74.4929	
alpha	5.9662	5.9662	5.9662	5.9662	5.9662	5.9662	5.9662	5.9662	5.9662	5.9662	5.9662	5.9662	
util living area													
0.9123	0.8519	0.7664	0.6423	0.4946	0.3471	0.2572	0.2733	0.4103	0.6412	0.8420	0.9227	0.9227	(86)

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Living	20.6420	20.7771	20.8885	20.9643	20.9933	20.9994	20.9999	20.9999	20.9981	20.9693	20.8228	20.6141
Non living	19.8713	20.0274	20.1508	20.2334	20.2591	20.2693	20.2705	20.2705	20.2686	20.2394	20.0864	19.8420
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	20.8168	20.7771	20.8885	20.9643	20.9933	20.9994	20.9999	20.9999	20.9981	20.9693	20.8228	20.6680 (87)
Th 2	20.2609	20.2609	20.2609	20.2650	20.2640	20.2697	20.2705	20.2705	20.2697	20.2650	20.2650	20.2650 (88)
util rest of house												
	0.8966	0.8297	0.7370	0.6058	0.4521	0.3021	0.2103	0.2259	0.3647	0.5990	0.8153	0.9084 (89)
MIT 2	20.1056	20.0274	20.1508	20.2334	20.2591	20.2693	20.2705	20.2705	20.2686	20.2394	20.0864	19.9183 (90)
Living area fraction									FLA = Living area / (4) =			
MIT	20.4484	20.3887	20.5063	20.5856	20.6129	20.6212	20.6220	20.6220	20.6202	20.5911	20.4413	20.2796 (92)
Temperature adjustment												0.0000
adjusted MIT	20.4484	20.3887	20.5063	20.5856	20.6129	20.6212	20.6220	20.6220	20.6202	20.5911	20.4413	20.2796 (93)

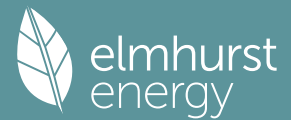
8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9008	0.8337	0.7471	0.6219	0.4723	0.3238	0.2329	0.2488	0.3867	0.6180	0.8220	0.9087 (94)
Useful gains	537.3849	562.2280	541.8342	461.0346	339.2148	223.1794	154.7291	163.2630	261.2779	398.6485	487.2506	524.8172 (95)
Ext temp.	5.0000	5.6000	7.1000	9.6000	12.7000	15.4000	17.0000	16.8000	14.5000	11.1000	7.7000	4.9000 (96)
Heat loss rate W	669.4070	640.8223	580.9206	473.1460	341.3068	223.3483	154.7471	163.2907	261.8055	408.7783	548.7609	662.3923 (97)
Space heating kWh	98.2244	52.8153	29.0803	8.7202	1.5564	0.0000	0.0000	0.0000	0.0000	7.5366	44.2874	102.3559 (98a)
Space heating requirement - total per year (kWh/year)												344.5766
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	98.2244	52.8153	29.0803	8.7202	1.5564	0.0000	0.0000	0.0000	0.0000	7.5366	44.2874	102.3559 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												344.5766
Space heating per m2										(98c) / (4) =		6.2925 (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 %)												249.1829 (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	98.2244	52.8153	29.0803	8.7202	1.5564	0.0000	0.0000	0.0000	0.0000	7.5366	44.2874	102.3559 (98)
Space heating efficiency (main heating system 1)	249.1829	249.1829	249.1829	249.1829	249.1829	0.0000	0.0000	0.0000	0.0000	249.1829	249.1829	249.1829 (210)
Space heating fuel (main heating system)	39.4186	21.1954	11.6703	3.4995	0.6246	0.0000	0.0000	0.0000	0.0000	3.0245	17.7731	41.0766 (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	204.6033	181.1086	192.8733	170.7609	166.3217	150.7372	149.4201	154.8797	156.0509	172.9679	182.6378	202.5292 (64)
Efficiency of water heater (217)m	153.1908	153.1908	153.1908	153.1908	153.1908	153.1908	153.1908	153.1908	153.1908	153.1908	153.1908	153.1908 (216)
Fuel for water heating, kWh/month	133.5611	118.2242	125.9040	111.4694	108.5716	98.3984	97.5386	101.1025	101.8670	112.9101	119.2224	132.2072 (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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	32.5659	26.1256	23.5232	17.2341	13.3121	10.8761	12.1438	15.7849	20.5031	26.9011	30.3848	33.4711 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-75.5503	-112.3974	-164.3440	-180.1893	-186.3200	-173.0825	-170.4404	-164.6269	-154.9001	-134.0206	-89.0423	-69.0516 (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	-14.4217	-39.9536	-95.8822	-162.0272	-210.9984	-220.0190	-211.9161	-172.8062	-133.4870	-71.2487	-24.4949	-12.2274 (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												138.2826 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												153.1908
Water heating fuel used												1360.9767 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
Total electricity for the above, kWh/year												0.0000 (231)
Electricity for lighting (calculated in Appendix L)												262.8259 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-3043.4475 (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												-1281.3623 (238)

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10a. Fuel costs - using BEDF prices (590)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	138.2826	28.4300	39.3137 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1360.9767	28.4300	386.9257 (247)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000 (247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (249)
Energy for lighting	262.8259	28.4300	74.7214 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1673.9652	28.4300	-475.9083
PV Unit electricity exported	-1369.4822	5.8100	-79.5669
Total			-555.4752 (252)
Total energy cost			-54.5144 (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	138.2826	0.1589	21.9755 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1360.9767	0.1407	191.5152 (264)
Space and water heating			213.4907 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	262.8259	0.1443	37.9339 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1673.9652	0.1349	-225.7566
PV Unit electricity exported	-1369.4822	0.1235	-169.1597
Total			-394.9164 (269)
Total CO2, kg/year			-143.4918 (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	138.2826	1.5882	219.6211 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1360.9767	1.5203	2069.1182 (278)
Space and water heating			2288.7393 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	262.8259	1.5338	403.1311 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1673.9652	1.4985	-2508.3738
PV Unit electricity exported	-1369.4822	0.4534	-620.9648
Total			-3129.3386 (283)
Total Primary energy kWh/year			-437.4682 (286)

Predicted Energy Assessment



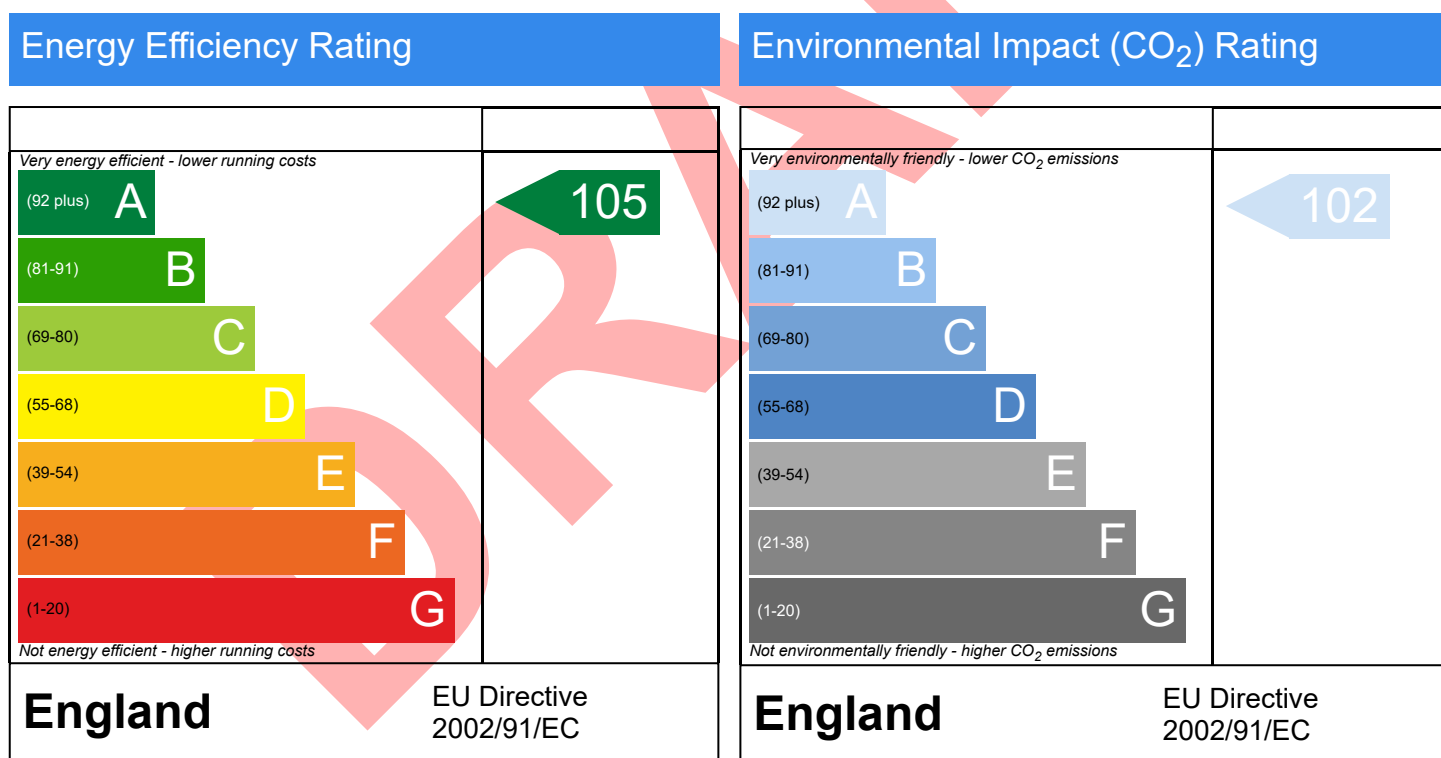
1295, Ashton Old Road, MANCHESTER, M11 1JS

Dwelling type:
Date of assessment:
SAP Version:
Produced by:
Total floor area:
DRRN:

Flat, Mid-Terrace
25/02/2026
10.2
George Achilleos
54.76 m²

This document is a Predicted Energy Assessment for properties marketed when they are incomplete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, this rating will be updated and an official Energy Performance Certificate will be created for the property. This will include more detailed information about the energy performance of the completed property.

The energy performance has been assessed using the Government approved SAP 10 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO₂) emissions.



The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO₂) emissions. The higher the rating the less impact it has on the environment.

Summary for Input Data

Plot Reference	M11 1JJ	Issued on Date	25/02/2026
Assessment Reference	1 BED	Plot Type Ref	
Plot Address	1295, Ashton Old Road, MANCHESTER, M11 1JS	SAP Version	10.2

SAP Rating	105 A	DER	-2.99	TER	11.25
Environmental	102 A	% DER < TER			126.58
CO ₂ Emissions (t/year)	-0.14	DFEE	16.54	TFEE	17.21
Compliance Check	See BREL	% DFEE < TFEE			3.91
% DPER < TPER	116.34	DPER	-9.83	TPER	60.15

Assessor Details	Mr. George Achilleos	Assessor ID	K679-0001
Client	Sterling Projects, Jude Baiden		

SUMMARY FOR INPUT DATA FOR: New Build (As Designed)

Orientation	West	
Property Tenture	1	
Transaction Type	8	
Terrain Type	Suburban	
1.0 Property Type	Flat, Mid-Terrace	
Position of Flat	Mid-floor flat	
Which Floor	1	
2.0 Number of Storeys	1	
3.0 Date Built	2026	
4.0 Sheltered Sides	3	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	212.21	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	Yes	
Smart gas meter fitted	No	

7.0 Measurements	Ground floor:	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
		15.75 m	54.76 m ²	2.80 m

8.0 Living Area	26.39	m ²
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9.0 External Walls											
Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Res	Shelter	Openings	Area Calculation Type	
External Wall 1	Cavity Wall	Cavity wall : dense plaster, dense block, filled cavity, any outside structure	0.16	190.00	44.10	34.76	2.10	Stairwell	Stairwell 1	9.34	Calculate Wall Area

9.1 Party Walls	Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Area (m ²)	Shelter Res	Shelter
	Party Wall 1	Filled Cavity with Edge Sealing	Double plasterboard on both sides, twin timber f rame with/without sheathing board	0.00	20.00	37.33		None

9.2 Internal Walls	Description	Construction	Kappa (kJ/m ² K)	Area (m ²)
	Internal Wall 1	Plasterboard on timber frame	9.00	48.48

10.1 Party Ceilings	Description	Construction	Kappa (kJ/m ² K)	Area (m ²)
	Party Ceiling 1	Precast concrete planks floor, screed, carpeted	30.00	54.76

11.1 Party Floors	Description	Storey Index	Construction	Kappa (kJ/m ² K)	Area (m ²)
	Party Floor 1	Lowest occupied	Precast concrete planks floor, screed, carpeted	40.00	54.76

Summary for Input Data

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
GLAZING	Manufacturer	Window	Double Low-E Soft 0.05			0.63		0.70	1.40

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
Opening	GLAZING	External Wall 1	South	9.34	

14.0 Conservatory

15.0 Draught Proofing

 %

16.0 Draught Lobby

17.0 Thermal Bridging

Y-value

 W/m²K

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present

20.0 Fans, Open Fireplaces, Flues

Number of open chimneys

Number of open flues

Number of chimneys/flues attached to closed fire

Number of flues attached to solid fuel boiler

Number of flues attached to other heater

Number of blocked chimneys

Number of intermittent extract fans

Number of passive vents

Number of flueless gas fires

21.0 Fixed Cooling System

22.0 Pressure Testing

Designed AP₅₀

 m²/(h.m²) @ 50 Pa

Test Method

22.0 Lighting

No Fixed Lighting

Name	Efficacy	Power	Capacity	Count
Lighting 1	150.00	66.90	10035.00	12

24.0 Main Heating 1

Description

Percentage of Heat

 %

Database Ref. No.

Fuel Type

In Winter

In Summer

Model Name

Manufacturer

System Type

Controls SAP Code

Controls description

Is MHS Pumped

Heating Pump Age

Heat Emitter

Flow Temperature

Summary for Input Data

Flow Temperature Value	35.00											
25.0 Main Heating 2	None											
26.0 Heat Networks	None											
27.0 Secondary Heating	None											
28.0 Water Heating												
Water Heating	Main Heating 1											
SAP Code	901											
Flue Gas Heat Recovery System	No											
Waste Water Heat Recovery Instantaneous System 1	No											
Waste Water Heat Recovery Instantaneous System 2	No											
Waste Water Heat Recovery Storage System	No											
Solar Panel	No											
Water use <= 125 litres/person/day	Yes											
Cold Water Source	From mains											
Bath Count	1											
Immersion Only Heating Hot Water	No											
28.3 Waste Water Heat Recovery System												
29.0 Hot Water Cylinder	Hot Water Cylinder											
Cylinder Stat	Yes											
Cylinder In Heated Space	Yes											
Independent Time Control	Yes											
Insulation Type	Measured Loss											
Cylinder Volume	150.00										L	
Loss	1.69										kWh/day	
Pipes insulation	Fully insulated primary pipework											
31.0 Thermal Store	None											
32.0 Photovoltaic Unit	Multiple Dwellings – Connected											
Export Capable Meter?	Yes											
Connected To Dwelling	Yes											
Diverter	Yes											
Battery Capacity [kWh]	3.50											
PV Cells kWp	Orientation	Elevation	Overshading	FGHRS	MCS Certificate	Overshading Factor	MCS Certificate Reference	Panel Manufacturer				
3.80	South	45°	None Or Little		No	1.00						
34.0 Small-scale Hydro	None											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Recommendations Lower cost measures None Further measures to achieve even higher standards												
				Typical Cost	Typical savings per year			Ratings after improvement				
								SAP rating	Environmental Impact			
Solar water heating								0			0	
Photovoltaic								0			0	
Wind turbine								0			0	

Thermal Bridging



Plot Reference	M11 1JJ	Issued on Date	25/02/2026
Assessment Reference	1 BED	Plot Type Ref	Mid-Terrace Flat
Plot Address	1295, Ashton Old Road, MANCHESTER, M11 1JS	SAP Version	10.2

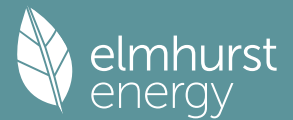
SAP Rating	105 A	DER	-2.99	TER	11.25
Environmental	102 A	% DER < TER			126.58
CO ₂ Emissions (t/year)	-0.14	DFEE	16.54	TFEE	17.21
Compliance Check	See BREL	% DFEE < TFEE			3.91
% DPER < TPER	116.34	DPER	-9.83	TPER	60.15

Assessor Details	Mr. George Achilleos	Assessor ID	K679-0001
Client	Sterling Projects, Jude Baiden		

	Junction details	Source Type	Psi (W/mK)	Length (m)	Result	Reference
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Total: 0.00 W/mK:
Y-Value: 0.00 W/m²K:

Energy Report



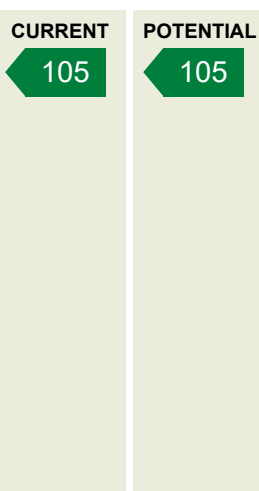
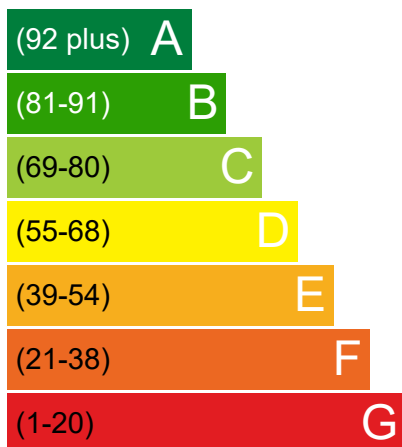
Dwelling Address	1295, Ashton Old Road, MANCHESTER, M11 1JS
Reference	M11 1JJ-1 BED
SAP Version	10.2
Assessment Date	25/02/2026
Submission Date	
Property Type	Flat, Mid-Terrace
Total Floor Area	55

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

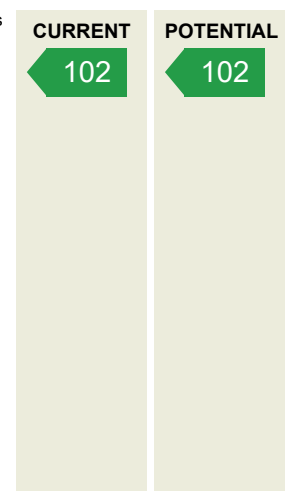
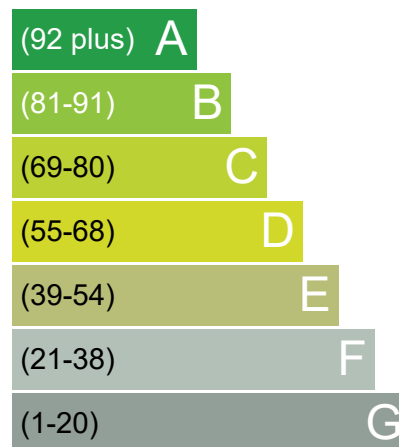
Energy Efficiency Rating

Most energy efficient - lower running costs



Carbon Dioxide (CO2) Emissions Rating

Very environmentally friendly - lower CO2 emissions



Additional ratings for your home

Energy Report

	Primary Energy	Energy	Carbon	Cost	HTC
CURRENT	-7.99 kWh	-1281 kWh	-143 kg	-54.51 £	43 W/K
POTENTIAL	-7.99 kWh	-1281 kWh	-143 kg	-54.51 £	43 W/K

Breakdown of property's energy performance

Each feature is assessed as one of the following:

Very Poor	Poor	Average	Good	Very Good
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Feature	Description	Energy Performance
Walls	Average thermal transmittance 0.12 W/m ² K	Very Good
Windows	High performance glazing	Good
Main heating	Air source heat pump, radiators, electric	Good
Main heating controls	Time and temperature zone control	Very Good
Secondary heating	None	
Hot water	From main system	Poor
Lighting	Excellent lighting efficiency	Very Good
Air tightness	Air permeability [AP50] = 4.5 m ³ /h.m ² (assumed)	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
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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.

Energy Report

		Estimated annual costs	Estimated annual costs after potential improvements	Potential future savings
Lighting		£75	£75	
Heating		£39	£39	
Hot Water		£387	£387	
New Technologies e.g. Impact of PV		-(£555)	-(£555)	
TOTAL		-(£55)	-(£55)	

Estimated energy use and potential savings



Space Heating

138

kWh per year



Water Heating

1361

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.