

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 11:35:01

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	74 m ²
Site Reference	M11 1JJ	Plot Reference	2 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	9.76 kgCO ₂ /m ²
Dwelling carbon dioxide emission rate	-2.13 kgCO ₂ /m ² OK

1b Target primary energy rate and dwelling primary energy

Target primary energy	51.94 kWh _{PE} /m ²
Dwelling primary energy	-8.03 kWh _{PE} /m ² OK

1c Target fabric energy efficiency and dwelling fabric energy efficiency

Target fabric energy efficiency	17.0 kWh/m ²
Dwelling fabric energy efficiency	16.7 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)	26.3592	0.12 (!)
Party wall: Party Wall (1)	72.09	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 OK
Air permeability test certificate reference	

4 Space heating		
Main heating system 1: Heat pump with radiators or underfloor heating - Electricity		
Efficiency	307.2%	
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	

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Plot Reference	M11 1JJ				Issued on Date	25/02/2026	
Assessment Reference	2 BED			Plot Type Ref			
Plot Address	1295, Ashton Old Road, MANCHESTER, M11 1JS				SAP Version	10.2	
SAP Rating	104 A	DER	-2.13	TER	9.76		
Environmental	102 A	% DER < TER				121.82	
CO ₂ Emissions (t/year)	-0.14	DFEE	16.67	TFEE	16.99		
Compliance Check	See BREL	% DFEE < TFEE				1.84	
% DPER < TPER	115.46	DPER	-8.03	TPER	51.94		
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	73.8000 (1b)	3.0000 (2b)	221.4000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.8000		221.4000 (4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 221.4000 (5)

2. Ventilation rate

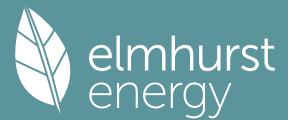
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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) = 0.0452 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.5000 (17)
Infiltration rate	0.2702 (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) = 0.2094 (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	0.2670	0.2617	0.2565	0.2303	0.2251	0.1989	0.1989	0.1937	0.2094	0.2251	0.2356	0.2460 (22b)
Effective ac	0.5356	0.5342	0.5329	0.5265	0.5253	0.5198	0.5198	0.5188	0.5219	0.5253	0.5277	0.5303 (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	35.7000	9.3400	26.3600	0.1200	3.1632	190.0000	5008.4000 (29a)					
Total net area of external elements Aum(A, m2)			35.7000				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	15.5458		(33)					
Main dwelling												
Party Wall 1			72.0900	0.0000	0.0000	20.0000	1441.8000 (32)					
Party Floor 1			73.8000			40.0000	2952.0000 (32d)					
Party Ceiling 1			73.8000			30.0000	2214.0000 (32b)					
Internal Wall 1			48.4800			9.0000	436.3200 (32c)					
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	12052.5200 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							163.3133 (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) =	15.5458 (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	39.1345	39.0334	38.9343	38.4688	38.3817	37.9764	37.9764	37.9013	38.1325	38.3817	38.5579	38.7421 (38)
Heat transfer coeff	54.6802	54.5791	54.4800	54.0146	53.9275	53.5221	53.5221	53.4471	53.6783	53.9275	54.1037	54.2879 (39)
Average = Sum(39)m / 12 =												54.0142
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.7409	0.7396	0.7382	0.7319	0.7307	0.7252	0.7252	0.7242	0.7273	0.7307	0.7331	0.7356 (40)
HLP (average)												0.7319
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3347 (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												
73.0552	71.9702	70.4423	67.6252	65.5158	63.1768	61.9134	63.4305	65.0825	67.5853	70.4604	72.8082	(42b)
Hot water usage for other uses												
38.5400	37.1386	35.7371	34.3357	32.9342	31.5328	31.5328	32.9342	34.3357	35.7371	37.1386	38.5400	(42c)
Average daily hot water use (litres/day)												102.7701 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	111.5952	109.1088	106.1795	101.9609	98.4500	94.7095	93.4461	96.3648	99.4182	103.3224	107.5990	111.3482 (44)
Energy conte	176.7395	155.3695	163.1939	139.5794	132.5326	116.4564	113.0150	119.3197	122.5925	140.2076	153.2945	174.3444 (45)
Energy content (annual)												
Distribution loss (46)m = 0.15 x (45)m												
26.5109	23.3054	24.4791	20.9369	19.8799	17.4685	16.9522	17.8980	18.3889	21.0311	22.9942	26.1517	(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	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month												
228.2925	201.9335	214.7469	189.4694	184.0856	166.3464	164.5680	170.8727	172.4825	191.7606	203.1845	225.8974	(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												
228.2925	201.9335	214.7469	189.4694	184.0856	166.3464	164.5680	170.8727	172.4825	191.7606	203.1845	225.8974	(64)
Total per year (kWh/year)												2313.6401 (64)
Electric shower(s)												2314 (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												
100.0083	88.9115	95.5044	86.3221	85.3095	78.6338	78.8199	80.9162	80.6740	87.8614	90.8824	99.2119	(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	116.7369	116.7369	116.7369	116.7369	116.7369	116.7369	116.7369	116.7369	116.7369	116.7369	116.7369	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
113.9755	126.1871	113.9755	117.7747	113.9755	117.7747	113.9755	113.9755	117.7747	113.9755	117.7747	113.9755	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
205.9988	208.1364	202.7497	191.2819	176.8060	163.2006	154.1114	151.9738	157.3605	168.8283	183.3042	196.9096	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
34.6737	34.6737	34.6737	34.6737	34.6737	34.6737	34.6737	34.6737	34.6737	34.6737	34.6737	34.6737	(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)												
-93.3895	-93.3895	-93.3895	-93.3895	-93.3895	-93.3895	-93.3895	-93.3895	-93.3895	-93.3895	-93.3895	-93.3895	(71)
Water heating gains (Table 5)												
134.4198	132.3088	128.3661	119.8919	114.6633	109.2136	105.9407	108.7583	112.0472	118.0933	126.2256	133.3494	(72)
Total internal gains												
512.4151	524.6535	503.1123	486.9695	463.4658	448.2099	432.0487	432.7287	445.2035	458.9181	485.3255	502.2555	(73)

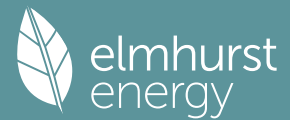
6. Solar gains

[Jan]												
	Area											
	m2											
	Solar flux											
	Table 6a											
	W/m2											
	Specific data											
	or Table 6b											
	Specific data											
	or Table 6c											
	Access											
	factor											
	Table 6d											
	Gains											
	W											
South	9.3400											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	645.8654	743.2106	781.5154	801.6254	791.3568	763.7603	740.3606	732.1423	736.0284	694.6525	643.5096	617.5688 (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	61.2273	61.3407	61.4523	61.9818	62.0819	62.5521	62.5521	62.6400	62.3701	62.0819	61.8797	61.6698
alpha	5.0818	5.0894	5.0968	5.1321	5.1388	5.1701	5.1701	5.1760	5.1580	5.1388	5.1253	5.1113
util living area												
0.9427	0.8972	0.8404	0.7414	0.6100	0.4445	0.3175	0.3350	0.4959	0.7365	0.8944	0.9515	(86)
Living	20.3214	20.5272	20.7029	20.8675	20.9580	20.9933	20.9990	20.9987	20.9879	20.8900	20.6056	20.2755
Non living	19.5260	19.7771	19.9874	20.1801	20.2767	20.3139	20.3181	20.3188	20.3078	20.2085	19.8809	19.4733

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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	20.6528	20.5272	20.7029	20.8675	20.9580	20.9933	20.9990	20.9987	20.9879	20.8900	20.6056	20.3768 (87)
Th 2	20.3048	20.3060	20.3072	20.3127	20.3138	20.3186	20.3186	20.3195	20.3167	20.3138	20.3117	20.3095 (88)
util rest of house												
	0.9336	0.8827	0.8196	0.7113	0.5707	0.3986	0.2686	0.2858	0.4492	0.7013	0.8773	0.9436 (89)
MIT 2	19.9943	19.7771	19.9874	20.1801	20.2767	20.3139	20.3181	20.3188	20.3078	20.2085	19.8809	19.6240 (90)
Living area fraction									FLA = Living area / (4) =			0.2856 (91)
MIT	20.1824	19.9913	20.1917	20.3765	20.4713	20.5080	20.5126	20.5130	20.5021	20.4031	20.0879	19.8390 (92)
Temperature adjustment												0.0000
adjusted MIT	20.1824	19.9913	20.1917	20.3765	20.4713	20.5080	20.5126	20.5130	20.5021	20.4031	20.0879	19.8390 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9318	0.8756	0.8159	0.7142	0.5799	0.4115	0.2826	0.2998	0.4620	0.7061	0.8712	0.9375 (94)
Useful gains	601.8366	650.7277	637.6367	572.5467	458.8995	314.2584	209.1924	219.5254	340.0148	490.4621	560.6388	578.9594 (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	868.4547	823.6724	745.9270	619.8968	473.0164	316.2067	209.4118	219.8293	343.6522	528.6583	702.6939	849.0097 (97)
Space heating kWh	198.3638	116.2188	80.5680	34.0921	10.5030	0.0000	0.0000	0.0000	0.0000	28.4180	102.2796	200.9174 (98a)
Space heating requirement - total per year (kWh/year)												771.3607
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	198.3638	116.2188	80.5680	34.0921	10.5030	0.0000	0.0000	0.0000	0.0000	28.4180	102.2796	200.9174 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												771.3607
Space heating per m2										(98c) / (4) =		10.4520 (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 %)												307.2107 (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	198.3638	116.2188	80.5680	34.0921	10.5030	0.0000	0.0000	0.0000	0.0000	28.4180	102.2796	200.9174 (98)
Space heating efficiency (main heating system 1)	307.2107	307.2107	307.2107	307.2107	307.2107	0.0000	0.0000	0.0000	0.0000	307.2107	307.2107	307.2107 (210)
Space heating fuel (main heating system)	64.5693	37.8303	26.2256	11.0973	3.4188	0.0000	0.0000	0.0000	0.0000	9.2503	33.2930	65.4005 (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	228.2925	201.9335	214.7469	189.4694	184.0856	166.3464	164.5680	170.8727	172.4825	191.7606	203.1845	225.8974 (64)
Efficiency of water heater (217)m	179.0400	179.0400	179.0400	179.0400	179.0400	179.0400	179.0400	179.0400	179.0400	179.0400	179.0400	179.0400 (216)
Fuel for water heating, kWh/month	127.5092	112.7868	119.9435	105.8252	102.8182	92.9102	91.9169	95.4383	96.3374	107.1049	113.4856	126.1715 (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	37.1856	29.8317	26.8601	19.6789	15.2005	12.4190	13.8664	18.0241	23.4115	30.7172	34.6950	38.2191 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-89.3928	-128.0361	-181.8649	-198.0832	-208.1674	-191.5544	-189.6688	-183.2054	-167.8739	-145.1220	-99.2431	-77.0293 (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	-16.9377	-43.3588	-95.7096	-155.9339	-215.6389	-220.0701	-218.6102	-182.1531	-130.9056	-69.9220	-25.6478	-12.8054 (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												251.0852 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												179.0400
Water heating fuel used												1292.2476 (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)												300.1093 (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												-1403.4921 (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	251.0852	0.1576	39.5739 (261)
Total CO ₂ associated with community systems			0.0000 (373)
Water heating (other fuel)	1292.2476	0.1408	181.9490 (264)
Space and water heating			221.5230 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	300.1093	0.1443	43.3150 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1859.2412	0.1350	-251.0036
PV Unit electricity exported	-1387.6931	0.1234	-171.2682
Total			-422.2718 (269)
Total CO ₂ , kg/year			-157.4338 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			-2.1300 (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	251.0852	1.5834	397.5736 (275)
Total CO ₂ associated with community systems			0.0000 (473)
Water heating (other fuel)	1292.2476	1.5206	1965.0227 (278)
Space and water heating			2362.5962 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	300.1093	1.5338	460.3177 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1859.2412	1.4990	-2786.9657
PV Unit electricity exported	-1387.6931	0.4530	-628.5658
Total			-3415.5315 (283)
Total Primary energy kWh/year			-592.6176 (286)
Dwelling Primary energy Rate (DPER)			-8.0300 (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	73.8000 (1b)	x 3.0000 (2b)	= 221.4000 (1b) - (3b)
Ground floor			(4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.8000		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	221.4000 (5)

2. Ventilation rate

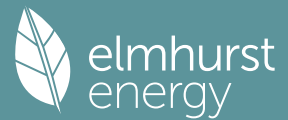
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (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) =	30.0000 / (5) = 0.1355 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3855 (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) = 0.2988 (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	0.3809	0.3735	0.3660	0.3286	0.3212	0.2838	0.2838	0.2764	0.2988	0.3212	0.3361	0.3510 (22b)
Effective ac	0.5726	0.5697	0.5670	0.5540	0.5516	0.5403	0.5403	0.5382	0.5446	0.5516	0.5565	0.5616 (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	35.7000	9.3400	26.3600	0.1800	4.7448		(29a)
Total net area of external elements Aum(A, m ²)			35.7000				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	15.4395	(33)

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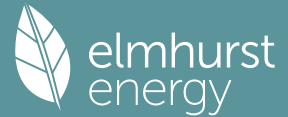
Main dwelling													
Party Wall 1						72.0900	0.0000	0.0000					(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K												163.3133	(35)
List of Thermal Bridges													
K1 Element									Length	Psi-value		Total	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)												0.0000	(36)
Point Thermal bridges												0.0000	
Total fabric heat loss											(33) + (36) + (36a) =	15.4395	(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	41.8317	41.6259	41.4242	40.4765	40.2992	39.4738	39.4738	39.3210	39.7917	40.2992	40.6579	41.0329	(38)
Average = Sum(39)m / 12 =	57.2712	57.0654	56.8636	55.9160	55.7387	54.9133	54.9133	54.7604	55.2312	55.7387	56.0973	56.4723	(39)
												55.9151	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	0.7760	0.7732	0.7705	0.7577	0.7553	0.7441	0.7441	0.7420	0.7484	0.7553	0.7601	0.7652	(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													2.3347 (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													
	73.0552	71.9702	70.4423	67.6252	65.5158	63.1768	61.9134	63.4305	65.0825	67.5853	70.4604	72.8082	(42b)
Hot water usage for other uses													
	38.5400	37.1386	35.7371	34.3357	32.9342	31.5328	31.5328	32.9342	34.3357	35.7371	37.1386	38.5400	(42c)
Average daily hot water use (litres/day)													102.7701 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	111.5952	109.1088	106.1795	101.9609	98.4500	94.7095	93.4461	96.3648	99.4182	103.3224	107.5990	111.3482	(44)
Energy conte	176.7395	155.3695	163.1939	139.5794	132.5326	116.4564	113.0150	119.3197	122.5925	140.2076	153.2945	174.3444	(45)
Energy content (annual)										Total = Sum(45)m =		1706.6451	
Distribution loss (46)m = 0.15 x (45)m													
	26.5109	23.3054	24.4791	20.9369	19.8799	17.4685	16.9522	17.8980	18.3889	21.0311	22.9942	26.1517	(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													
	223.3345	197.4552	209.7888	184.6712	179.1276	161.5483	159.6099	165.9146	167.6844	186.8025	198.3864	220.9393	(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	223.3345	197.4552	209.7888	184.6712	179.1276	161.5483	159.6099	165.9146	167.6844	186.8025	198.3864	220.9393	(64)
12Total per year (kWh/year)													2255.2625 (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													
	96.0418	85.3289	91.5379	82.4836	81.3430	74.7952	74.8534	76.9497	76.8355	83.8949	87.0439	95.2454	(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	116.7369	116.7369	116.7369	116.7369	116.7369	116.7369	116.7369	116.7369	116.7369	116.7369	116.7369	116.7369	(66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	113.9755	126.1871	113.9755	117.7747	113.9755	117.7747	113.9755	113.9755	117.7747	113.9755	117.7747	113.9755	(67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	205.9988	208.1364	202.7497	191.2819	176.8060	163.2006	154.1114	151.9738	157.3605	168.8283	183.3042	196.9096	(68)
Pumps, fans	34.6737	34.6737	34.6737	34.6737	34.6737	34.6737	34.6737	34.6737	34.6737	34.6737	34.6737	34.6737	(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)	-93.3895	-93.3895	-93.3895	-93.3895	-93.3895	-93.3895	-93.3895	-93.3895	-93.3895	-93.3895	-93.3895	-93.3895	(71)
Total internal gains	129.0885	126.9776	123.0348	114.5606	109.3320	103.8823	100.6094	103.4271	106.7160	112.7620	120.8943	128.0181	(72)
	510.0838	522.3222	500.7810	484.6382	461.1345	442.8786	426.7174	427.3974	439.8722	456.5868	482.9942	499.9242	(73)

6. Solar gains													
[Jan]													
		Area		Solar flux		g		FF		Access		Gains	
		m2		Table 6a		W/m2		Specific data		factor		W	
								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	643.5341	740.8793	779.1841	799.2941	789.0255	758.4290	735.0293	726.8110	730.6971	692.3212	641.1783	615.2375	(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	58.4573	58.6882	58.8764	59.8742	60.0646	60.9674	60.9674	61.1376	60.6165	60.0646	59.6806	59.2843
alpha	4.8972	4.9112	4.9251	4.9916	5.0043	5.0645	5.0645	5.0758	5.0411	5.0043	4.9787	4.9523
util living area	0.9480	0.9065	0.8538	0.7569	0.6270	0.4583	0.3279	0.3455	0.5120	0.7519	0.9027	0.9555 (86)
MIT	20.2351	20.4538	20.6478	20.8411	20.9475	20.9914	20.9987	20.9983	20.9845	20.8686	20.5543	20.2006 (87)
Th 2	20.2742	20.2766	20.2790	20.2902	20.2923	20.3021	20.3021	20.3039	20.2983	20.2923	20.2880	20.2836 (88)
util rest of house	0.9394	0.8927	0.8335	0.7267	0.5863	0.4101	0.2763	0.2937	0.4630	0.7164	0.8863	0.9480 (89)
MIT 2	19.3949	19.6639	19.8985	20.1306	20.2459	20.2961	20.3014	20.3030	20.2868	20.1661	19.7997	19.3598 (90)
Living area fraction	19.6349	19.8895	20.1126	20.3336	20.4463	20.4947	20.5006	20.5016	20.4861	20.3667	20.0153	19.6000 (92)
MIT	19.6349	19.8895	20.1126	20.3336	20.4463	20.4947	20.5006	20.5016	20.4861	20.3667	20.0153	19.6000 (93)
Temperature adjustment												0.0000
adjusted MIT	19.6349	19.8895	20.1126	20.3336	20.4463	20.4947	20.5006	20.5016	20.4861	20.3667	20.0153	19.6000 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9306	0.8845	0.8285	0.7287	0.5954	0.4235	0.2910	0.3085	0.4763	0.7203	0.8792	0.9396 (94)
Useful gains	598.8883	655.3329	645.5321	582.4240	469.7822	321.1946	213.8999	224.2053	348.0123	498.6556	563.7454	578.0778 (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	878.2469	855.3824	774.0593	639.3204	487.5059	323.6961	214.1946	224.6058	352.7105	544.3846	724.5116	869.6733 (97)
Space heating kWh	207.8428	134.4333	95.6242	40.9654	13.1864	0.0000	0.0000	0.0000	0.0000	34.0224	115.7517	216.9471 (98a)
Space heating requirement - total per year (kWh/year)												858.7732
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	207.8428	134.4333	95.6242	40.9654	13.1864	0.0000	0.0000	0.0000	0.0000	34.0224	115.7517	216.9471 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												858.7732
Space heating per m2										(98c) / (4) =		11.6365 (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	207.8428	134.4333	95.6242	40.9654	13.1864	0.0000	0.0000	0.0000	0.0000	34.0224	115.7517	216.9471 (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)	225.1818	145.6482	103.6016	44.3829	14.2865	0.0000	0.0000	0.0000	0.0000	36.8607	125.4081	235.0456 (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	223.3345	197.4552	209.7888	184.6712	179.1276	161.5483	159.6099	165.9146	167.6844	186.8025	198.3864	220.9393 (64)	
Efficiency of water heater (217)m	83.8989	83.2163	82.4153	81.2959	80.3584	79.8000	79.8000	79.8000	79.8000	81.0659	82.8958	79.8000 (216)	
Fuel for water heating, kWh/month	266.1948	237.2795	254.5509	227.1593	222.9107	202.4415	200.0124	207.9131	210.1308	230.4330	239.3203	262.9639 (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	23.6819	18.9985	17.1060	12.5326	9.6805	7.9091	8.8309	11.4788	14.9098	19.5624	22.0957	24.3400 (232)	
Electricity generated by PVs (Appendix M) (negative quantity)	-16.3505	-24.5148	-37.4430	-44.8155	-50.7309	-48.2358	-47.6542	-43.7941	-37.4111	-29.2101	-18.4898	-13.9709 (233a)	
Electricity generated by wind turbines (Appendix M) (negative quantity)	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)	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)	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)	-5.2611	-11.3674	-23.1673	-35.6565	-48.0038	-48.5504	-47.9742	-40.2166	-28.9585	-16.5264	-7.1093	-4.1379 (233b)	
Electricity generated by wind turbines (Appendix M) (negative quantity)	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)	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)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)	
Annual totals kWh/year													
Space heating fuel - main system 1													930.4152 (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													2761.3100 (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)													191.1261 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation													-729.5500 (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	3239.3013 (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	930.4152	0.2100	195.3872 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2761.3100	0.2100	579.8751 (264)
Space and water heating			775.2623 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	191.1261	0.1443	27.5854 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-412.6207	0.1333	-55.0102
PV Unit electricity exported	-316.9292	0.1252	-39.6760
Total			-94.6862 (269)
Total CO2, kg/year			720.0908 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.7600 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	930.4152	1.1300	1051.3692 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2761.3100	1.1300	3120.2803 (278)
Space and water heating			4171.6495 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	191.1261	1.5338	293.1556 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-412.6207	1.4927	-615.8992
PV Unit electricity exported	-316.9292	0.4595	-145.6273
Total			-761.5266 (283)
Total Primary energy kWh/year			3833.3793 (286)
Target Primary Energy Rate (TPER)			51.9400 (287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	73.8000	3.0000	221.4000
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.8000		221.4000
Dwelling volume			221.4000

2. Ventilation rate

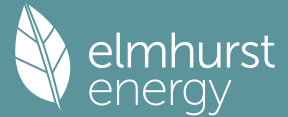
	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number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

Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1355 (8)
Pressure test	Yes		
Pressure Test Method	Blower Door		
Measured/design AP50	4.5000		(17)
Infiltration rate	0.3605		(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) =	0.2794	(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
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	0.3562	0.3492	0.3423	0.3073	0.3003	0.2654	0.2654	0.2584	0.2794	0.3003	0.3143	0.3283
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.5634	0.5610	0.5586	0.5472	0.5451	0.5352	0.5352	0.5334	0.5390	0.5451	0.5494	0.5539

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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	35.7000	9.3400	26.3600	0.1200	3.1632	190.0000	5008.4000	(29a)					
Total net area of external elements Aum(A, m2)			35.7000					(31)					
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		15.5458			(33)					
Main dwelling													
Party Wall 1			72.0900	0.0000	0.0000	20.0000	1441.8000	(32)					
Party Floor 1			73.8000			40.0000	2952.0000	(32d)					
Party Ceiling 1			73.8000			30.0000	2214.0000	(32b)					
Internal Wall 1			48.4800			9.0000	436.3200	(32c)					
Heat capacity Cm = Sum(A x k)								(28)...(30) + (32) + (32a)...(32e) = 12052.5200 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								163.3133 (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) =	15.5458 (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	41.1665	40.9865	40.8101	39.9814	39.8263	39.1045	39.1045	38.9708	39.3825	39.8263	40.1400	40.4679	(38)
Average = Sum(39)m / 12 =	56.7123	56.5323	56.3559	55.5271	55.3721	54.6503	54.6503	54.5166	54.9283	55.3721	55.6858	56.0137	(39)
												55.5264	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	0.7685	0.7660	0.7636	0.7524	0.7503	0.7405	0.7405	0.7387	0.7443	0.7503	0.7545	0.7590	(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													2.3347 (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	0.0000	(42a)
Hot water usage for baths													
27.3725	26.9660	26.3935	25.3380	24.5476	23.6712	23.1978	23.7663	24.3853	25.3230	26.4003	27.2799	27.2799	(42b)
Hot water usage for other uses													
38.5400	37.1386	35.7371	34.3357	32.9342	31.5328	31.5328	32.9342	34.3357	35.7371	37.1386	38.5400	38.5400	(42c)
Average daily hot water use (litres/day)												60.4150	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
65.9125	64.1046	62.1306	59.6737	57.4818	55.2040	54.7306	56.7005	58.7209	61.0602	63.5389	65.8200	65.8200	(44)
Energy content (annual)	104.3893	91.2840	95.4925	81.6902	77.3816	67.8797	66.1919	70.2071	72.4088	82.8581	90.5228	103.0582	(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	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	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													
88.7309	77.5914	81.1686	69.4367	65.7744	57.6978	56.2631	59.6760	61.5475	70.4293	76.9444	87.5995	87.5995	(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	88.7309	77.5914	81.1686	69.4367	65.7744	57.6978	56.2631	59.6760	61.5475	70.4293	76.9444	87.5995	(64)
Total per year (kWh/year)												852.8596	(64)
Electric shower(s)	50.7452	45.2144	49.3724	47.1155	47.9996	45.7870	47.3132	47.9996	47.1155	49.3724	48.4440	50.7452	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												577.2241	(64a)
Heat gains from water heating, kWh/month	34.8690	30.7015	32.6353	29.1381	28.4435	25.8712	25.8941	26.9189	27.1657	29.9504	31.3471	34.5862	(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	116.7369	116.7369	116.7369	116.7369	116.7369	116.7369	116.7369	116.7369	116.7369	116.7369	116.7369	116.7369	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
113.9755	126.1871	113.9755	117.7747	113.9755	117.7747	113.9755	113.9755	117.7747	113.9755	117.7747	113.9755	113.9755	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
205.9988	208.1364	202.7497	191.2819	176.8060	163.2006	154.1114	151.9738	157.3605	168.8283	183.3042	196.9096	196.9096	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
34.6737	34.6737	34.6737	34.6737	34.6737	34.6737	34.6737	34.6737	34.6737	34.6737	34.6737	34.6737	34.6737	(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)													
-93.3895	-93.3895	-93.3895	-93.3895	-93.3895	-93.3895	-93.3895	-93.3895	-93.3895	-93.3895	-93.3895	-93.3895	-93.3895	(71)
Water heating gains (Table 5)													
46.8670	45.6867	43.8646	40.4695	38.2305	35.9322	34.8039	36.1813	37.7302	40.2560	43.5376	46.4868	46.4868	(72)
Total internal gains	424.8623	438.0313	418.6108	407.5472	387.0330	374.9286	360.9118	360.1517	370.8864	381.0808	402.6376	415.3929	(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	558.3126	656.5885	697.0139	722.2031	714.9239	690.4789	669.2238	659.5653	661.7113	616.8152	560.8217	530.7062 (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	59.0334	59.2214	59.4068	60.2934	60.4623	61.2608	61.2608	61.4110	60.9508	60.4623	60.1217	59.7697
alpha	4.9356	4.9481	4.9605	5.0196	5.0308	5.0841	5.0841	5.0941	5.0634	5.0308	5.0081	4.9846
util living area	0.9684	0.9354	0.8909	0.8024	0.6754	0.4985	0.3580	0.3785	0.5577	0.8043	0.9359	0.9741 (86)
MIT	20.1006	20.3445	20.5653	20.7946	20.9286	20.9877	20.9981	20.9975	20.9778	20.8226	20.4465	20.0591 (87)
Th 2	20.2808	20.2829	20.2850	20.2948	20.2966	20.3052	20.3052	20.3068	20.3019	20.2966	20.2929	20.2890 (88)
util rest of house	0.9628	0.9249	0.8739	0.7743	0.6344	0.4472	0.3021	0.3222	0.5060	0.7715	0.9237	0.9694 (89)
MIT 2	19.4647	19.7019	19.9133	20.1314	20.2466	20.2984	20.3045	20.3057	20.2889	20.1608	19.8117	19.4309 (90)
Living area fraction	19.6463	19.8855	20.0996	20.3208	20.4414	20.4953	20.5026	20.5033	20.4857	20.3498	19.9930	19.6103 (92)
Temperature adjustment	19.6463	19.8855	20.0996	20.3208	20.4414	20.4953	20.5026	20.5033	20.4857	20.3498	19.9930	0.0000
adjusted MIT	19.6463	19.8855	20.0996	20.3208	20.4414	20.4953	20.5026	20.5033	20.4857	20.3498	19.9930	19.6103 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9568	0.9183	0.8691	0.7754	0.6431	0.4614	0.3180	0.3383	0.5198	0.7741	0.9179	0.9639 (94)
Useful gains	534.2085	602.9507	605.7902	559.9959	459.7474	318.5802	212.8432	223.0997	343.9833	477.4876	514.7511	511.5724 (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	870.3244	847.1625	766.4147	634.1651	484.0300	322.1800	213.2776	223.6998	350.7531	539.8683	717.9576	863.1886 (97)
Space heating kWh	250.0702	164.1103	119.5046	53.4018	18.0663	0.0000	0.0000	0.0000	0.0000	46.4113	146.3086	261.6025 (98a)
Space heating requirement - total per year (kWh/year)												1059.4756
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	250.0702	164.1103	119.5046	53.4018	18.0663	0.0000	0.0000	0.0000	0.0000	46.4113	146.3086	261.6025 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1059.4756
Space heating per m2												14.3560 (99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	513.7127	404.4121	414.3263	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9504	0.9777	0.9744	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	488.2335	395.4027	403.7086	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	756.3507	733.9990	725.0162	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	193.0444	251.9156	239.0528	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	48.2611	62.9789	59.7632	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												171.0032 (107)
Energy for space heating												14.3560 (99)
Energy for space cooling												2.3171 (108)
Total												16.6732 (109)
Fabric Energy Efficiency (DFEE)												16.7 (109)

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

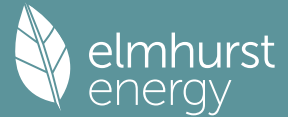
1. Overall dwelling characteristics

Main dwelling	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	73.8000 (1b)	x 3.0000 (2b)	= 221.4000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.8000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	221.4000 (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)
3 * 10 = 30.0000 (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) =
Pressure test
Pressure Test Method
Measured/design AP50
Infiltration rate
Number of sides sheltered

Air changes per hour
30.0000 / (5) = 0.1355 (8)
Yes
Blower Door
5.0000 (17)
0.3855 (18)
3 (19)

Shelter factor (20) = 1 - [0.075 x (19)] = 0.7750 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.2988 (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 (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	0.3809	0.3735	0.3660	0.3286	0.3212	0.2838	0.2838	0.2764	0.2988	0.3212	0.3361	0.3510 (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	0.5726	0.5697	0.5670	0.5540	0.5516	0.5403	0.5403	0.5382	0.5446	0.5516	0.5565	0.5616 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Main dwelling							
TER Opening Type			9.3400	1.1450	10.6947		(27)
External Wall 1	35.7000	9.3400	26.3600	0.1800	4.7448		(29a)
Total net area of external elements Aum(A, m2)			35.7000				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	15.4395	(33)
Main dwelling							
Party Wall 1			72.0900	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							163.3133 (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) =	15.4395 (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
	41.8317	41.6259	41.4242	40.4765	40.2992	39.4738	39.4738	39.3210	39.7917	40.2992	40.6579	41.0329 (38)
Heat transfer coeff	57.2712	57.0654	56.8636	55.9160	55.7387	54.9133	54.9133	54.7604	55.2312	55.7387	56.0973	56.4723 (39)
Average = Sum(39)m / 12 =												55.9151

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.7760	0.7732	0.7705	0.7577	0.7553	0.7441	0.7441	0.7420	0.7484	0.7553	0.7601	0.7652 (40)
HLP (average)												0.7577
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

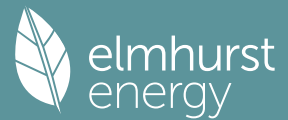
Assumed occupancy 2.3347 (42)

Hot water usage for mixer showers

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	65.9125	64.1046	62.1306	59.6737	57.4818	55.2040	54.7306	56.7005	58.7209	61.0602	63.5389	65.8200 (44)
Energy conte	104.3893	91.2840	95.4925	81.6902	77.3816	67.8797	66.1919	70.2071	72.4088	82.8581	90.5228	103.0582 (45)
Energy content (annual)										Total = Sum(45)m =		1003.3642
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												
	88.7309	77.5914	81.1686	69.4367	65.7744	57.6978	56.2631	59.6760	61.5475	70.4293	76.9444	87.5995 (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	88.7309	77.5914	81.1686	69.4367	65.7744	57.6978	56.2631	59.6760	61.5475	70.4293	76.9444	87.5995 (64)
12Total per year (kWh/year)								Total per year (kWh/year) = Sum(64)m =				852.8596 (64)
Electric shower(s)	50.7452	45.2144	49.3724	47.1155	47.9996	45.7870	47.3132	47.9996	47.1155	49.3724	48.4440	50.7452 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												577.2241 (64a)
Heat gains from water heating, kWh/month												
	34.8690	30.7015	32.6353	29.1381	28.4435	25.8712	25.8941	26.9189	27.1657	29.9504	31.3471	34.5862 (65)

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	116.7369	116.7369	116.7369	116.7369	116.7369	116.7369	116.7369	116.7369	116.7369	116.7369	116.7369	116.7369	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	113.9755	126.1871	113.9755	117.7747	113.9755	117.7747	113.9755	113.9755	117.7747	113.9755	117.7747	113.9755	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	205.9988	208.1364	202.7497	191.2819	176.8060	163.2006	154.1114	151.9738	157.3605	168.8283	183.3042	196.9096	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.6737	34.6737	34.6737	34.6737	34.6737	34.6737	34.6737	34.6737	34.6737	34.6737	34.6737	34.6737	(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)	-93.3895	-93.3895	-93.3895	-93.3895	-93.3895	-93.3895	-93.3895	-93.3895	-93.3895	-93.3895	-93.3895	-93.3895	(71)
Water heating gains (Table 5)	46.8670	45.6867	43.8646	40.4695	38.2305	35.9322	34.8039	36.1813	37.7302	40.2560	43.5376	46.4868	(72)
Total internal gains	424.8623	438.0313	418.6108	407.5472	387.0330	374.9286	360.9118	360.1517	370.8864	381.0808	402.6376	415.3929	(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	558.3126	656.5885	697.0139	722.2031	714.9239	690.4789	669.2238	659.5653	661.7113	616.8152	560.8217	530.7062	(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	58.4573	58.6682	58.8764	59.8742	60.0646	60.9674	60.9674	61.1376	60.6165	60.0646	59.6806	59.2843		
alpha	4.8972	4.9112	4.9251	4.9916	5.0043	5.0645	5.0645	5.0758	5.0411	5.0043	4.9787	4.9523		
util living area	0.9689	0.9365	0.8928	0.8048	0.6784	0.5007	0.3597	0.3801	0.5602	0.8066	0.9368	0.9744	(86)	
MIT	20.0825	20.3284	20.5527	20.7883	20.9259	20.9872	20.9980	20.9974	20.9769	20.8175	20.4357	20.0440	(87)	
Th 2	20.2742	20.2766	20.2790	20.2902	20.2923	20.3021	20.3021	20.3039	20.2983	20.2923	20.2880	20.2836	(88)	
util rest of house	0.9633	0.9261	0.8759	0.7768	0.6372	0.4489	0.3033	0.3234	0.5082	0.7738	0.9247	0.9697	(89)	
MIT 2	19.4415	19.6812	19.8963	20.1217	20.2403	20.2950	20.3013	20.3028	20.2848	20.1525	19.7973	19.4117	(90)	
Living area fraction	19.6246	19.8661	20.0838	20.3121	20.4361	20.4928	20.5003	20.5012	20.4825	20.3424	19.9797	19.5923	(91)	
MIT	19.6246	19.8661	20.0838	20.3121	20.4361	20.4928	20.5003	20.5012	20.4825	20.3424	19.9797	19.5923	(92)	
Temperature adjustment												0.0000		
adjusted MIT	19.6246	19.8661	20.0838	20.3121	20.4361	20.4928	20.5003	20.5012	20.4825	20.3424	19.9797	19.5923	(93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Useful gains	0.9573	0.9194	0.8709	0.7777	0.6458	0.4632	0.3194	0.3396	0.5221	0.7763	0.9187	0.9643	(94)	
Ext temp.	534.4882	603.6704	607.0251	561.6367	461.7006	319.8514	213.7240	223.9580	345.4675	478.8095	515.2448	511.7489	(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	877.6595	854.0448	772.4244	638.1182	486.9400	323.5906	214.1787	224.5837	352.5113	543.0287	722.5167	869.2393	(97)	
Space heating requirement - total per year (kWh/year)	255.3195	168.2516	123.0571	55.0667	18.7781	0.0000	0.0000	0.0000	0.0000	47.7791	149.2358	265.9729	(98a)	
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)	255.3195	168.2516	123.0571	55.0667	18.7781	0.0000	0.0000	0.0000	0.0000	47.7791	149.2358	265.9729	(98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												1083.4607	(99)	
Space heating per m2												14.6810	(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	516.1848	406.3583	416.1793	0.0000	0.0000	0.0000	0.0000	(100)	
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9491	0.9770	0.9736	0.0000	0.0000	0.0000	0.0000	(101)	
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	489.9199	397.0187	405.2094	0.0000	0.0000	0.0000	0.0000	(102)	
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	756.3507	733.9990	725.0162	0.0000	0.0000	0.0000	0.0000	(103)	
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	191.8301	250.7133	237.9363	0.0000	0.0000	0.0000	0.0000	(104)	
Cooled fraction									fc = cooled area / (4) =				(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	47.9575	62.6783	59.4841	0.0000	0.0000	0.0000	0.0000	(107)	
Space cooling requirement													170.1199	(107)
Energy for space heating													14.6810	(99)
Energy for space cooling													2.3051	(108)
Total													16.9862	(109)
Fabric Energy Efficiency (TFEE)													17.0	(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		73.8000 (1b)	x 3.0000 (2b)	= 221.4000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.8000			(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 221.4000 (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) =	0.0452 (8)
Pressure test											Yes
Pressure Test Method											Blower Door
Measured/design AP50											4.5000 (17)
Infiltration rate											0.2702 (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) =	0.2094 (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	0.2670	0.2617	0.2565	0.2303	0.2251	0.1989	0.1989	0.1937	0.2094	0.2251	0.2356	0.2460 (22b)
	0.5356	0.5342	0.5329	0.5265	0.5253	0.5198	0.5198	0.5188	0.5219	0.5253	0.5277	0.5303 (25)

3. Heat losses and heat loss parameter

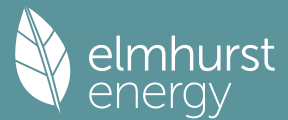
Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
GLAZING			9.3400	1.3258	12.3826		(27)
External Wall 1	35.7000	9.3400	26.3600	0.1200	3.1632	190.0000	5008.4000 (29a)
Total net area of external elements A _{um} (A, m ²)			35.7000				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	15.5458	(33)
Main dwelling							
Party Wall 1			72.0900	0.0000	0.0000	20.0000	1441.8000 (32)
Party Floor 1			73.8000			40.0000	2952.0000 (32d)
Party Ceiling 1			73.8000			30.0000	2214.0000 (32b)
Internal Wall 1			48.4800			9.0000	436.3200 (32c)
Heat capacity C _m = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	12052.5200 (34)
Thermal mass parameter (TMP = C _m / TFA) in kJ/m ² K							163.3133 (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) =
Total fabric heat loss							(33) + (36) + (36a) =

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	39.1345	39.0334	38.9343	38.4688	38.3817	37.9764	37.9764	37.9013	38.1325	38.3817	38.5579	38.7421 (38)
Average = Sum(39)m / 12 =	54.6802	54.5791	54.4800	54.0146	53.9275	53.5221	53.5221	53.4471	53.6783	53.9275	54.1037	54.2879 (39)
												54.0142
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.7409	0.7396	0.7382	0.7319	0.7307	0.7252	0.7252	0.7242	0.7273	0.7307	0.7331	0.7356 (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												2.3347 (42)
Hot water usage for mixer showers												0.0000 (42a)
Hot water usage for baths												73.0552
Hot water usage for other uses												38.5400
Average daily hot water use (litres/day)												102.7701 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	111.5952	109.1088	106.1795	101.9609	98.4500	94.7095	93.4461	96.3648	99.4182	103.3224	107.5990	111.3482 (44)
Energy content (annual)	176.7395	155.3695	163.1939	139.5794	132.5326	116.4564	113.0150	119.3197	122.5925	140.2076	153.2945	174.3444 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 1706.6451

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	26.5109	23.3054	24.4791	20.9369	19.8799	17.4685	16.9522	17.8980	18.3889	21.0311	22.9942	26.1517 (46)
Water storage loss (or HIU loss):												150.0000 (47)
Store volume												1.6900 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												0.9126 (55)
Enter (49) or (54) in (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	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												
	228.2925	201.9335	214.7469	189.4694	184.0856	166.3464	164.5680	170.8727	172.4825	191.7606	203.1845	225.8974 (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												
	228.2925	201.9335	214.7469	189.4694	184.0856	166.3464	164.5680	170.8727	172.4825	191.7606	203.1845	225.8974 (64)
												2313.6401 (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												
	100.0083	88.9115	95.5044	86.3221	85.3095	78.6338	78.8199	80.9162	80.6740	87.8614	90.8824	99.2119 (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	140.0842	140.0842	140.0842	140.0842	140.0842	140.0842	140.0842	140.0842	140.0842	140.0842	140.0842	140.0842	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	42.4836	37.7335	30.6870	23.2320	17.3662	14.6613	15.8420	20.5921	27.6386	35.0936	40.9594	43.6643	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	307.4609	310.6514	302.6114	285.4954	263.8895	243.5830	230.0170	226.8266	234.8665	251.9825	273.5884	293.8949	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	51.3432	51.3432	51.3432	51.3432	51.3432	51.3432	51.3432	51.3432	51.3432	51.3432	51.3432	51.3432	(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)													
	-93.3895	-93.3895	-93.3895	-93.3895	-93.3895	-93.3895	-93.3895	-93.3895	-93.3895	-93.3895	-93.3895	-93.3895	(71)
Water heating gains (Table 5)													
	134.4198	132.3088	128.3661	119.8919	114.6633	109.2136	105.9407	108.7583	112.0472	118.0933	126.2256	133.3494	(72)
Total internal gains													
	582.4021	578.7317	559.7024	526.6572	493.9570	465.4958	449.8377	454.2149	472.5903	503.2073	538.8113	568.9465	(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	715.8524	797.2888	838.1055	841.3131	821.8479	781.0462	758.1496	753.6285	763.4151	738.9417	696.9954	684.2598 (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	61.2273	61.3407	61.4523	61.9818	62.0819	62.5521	62.5521	62.6400	62.3701	62.0819	61.8797	61.6698	
alpha	5.0818	5.0894	5.0968	5.1321	5.1388	5.1701	5.1701	5.1760	5.1580	5.1388	5.1253	5.1113	
util living area													
	0.9188	0.8736	0.8103	0.7166	0.5905	0.4351	0.3101	0.3256	0.4791	0.7046	0.8668	0.9305 (86)	
Living	20.4304	20.5935	20.7526	20.8867	20.9637	20.9939	20.9991	20.9989	20.9896	20.9102	20.6695	20.3851	
Non living	19.6586	19.8554	20.0436	20.2002	20.2819	20.3144	20.3182	20.3189	20.3091	20.2288	19.9550	19.6075	
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	20.7086	20.5935	20.7526	20.8867	20.9637	20.9939	20.9991	20.9989	20.9896	20.9102	20.6695	20.4711 (87)	
Th 2	20.3048	20.3060	20.3072	20.3127	20.3138	20.3186	20.3186	20.3195	20.3167	20.3138	20.3117	20.3095 (88)	
util rest of house													
	0.9070	0.8572	0.7877	0.6861	0.5517	0.3900	0.2623	0.2777	0.4337	0.6688	0.8471	0.9201 (89)	
MIT 2	20.0472	19.8554	20.0436	20.2002	20.2819	20.3144	20.3182	20.3189	20.3091	20.2288	19.9550	19.7340 (90)	
Living area fraction													
MIT	20.2361	20.0662	20.2462	20.3963	20.4767	20.5085	20.5127	20.5131	20.5035	20.4234	20.1591	19.9445 (92)	
Temperature adjustment													
adjusted MIT	20.2361	20.0662	20.2462	20.3963	20.4767	20.5085	20.5127	20.5131	20.5035	20.4234	20.1591	19.9445 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9058	0.8510	0.7856	0.6899	0.5611	0.4026	0.2760	0.2914	0.4462	0.6747	0.8424	0.9139 (94)	
Useful gains	648.4076	678.5271	658.4240	580.4489	461.1135	314.4713	209.2194	219.5702	340.6244	498.5963	587.1372	625.3576 (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													
	871.3910	827.7587	748.8912	620.9678	473.3039	316.2337	209.4153	219.8351	343.7297	529.7534	706.5460	854.7363 (97)	
Space heating kWh													
	165.8996	100.2836	67.3076	29.1736	9.0697	0.0000	0.0000	0.0000	0.0000	23.1809	85.9743	170.6577 (98a)	
Space heating requirement - total per year (kWh/year)												651.5471	
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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165.8996	100.2836	67.3076	29.1736	9.0697	0.0000	0.0000	0.0000	0.0000	23.1809	85.9743	170.6577 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)											651.5471
Space heating per m2											(98c) / (4) = 8.8286 (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 %)												307.2107 (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	165.8996	100.2836	67.3076	29.1736	9.0697	0.0000	0.0000	0.0000	0.0000	23.1809	85.9743	170.6577 (98)
Space heating efficiency (main heating system 1)	307.2107	307.2107	307.2107	307.2107	307.2107	0.0000	0.0000	0.0000	0.0000	307.2107	307.2107	307.2107 (210)
Space heating fuel (main heating system)	54.0019	32.6433	21.9093	9.4963	2.9523	0.0000	0.0000	0.0000	0.0000	7.5456	27.9855	55.5507 (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	228.2925	201.9335	214.7469	189.4694	184.0856	166.3464	164.5680	170.8727	172.4825	191.7606	203.1845	225.8974 (64)
Efficiency of water heater (217)m	179.0400	179.0400	179.0400	179.0400	179.0400	179.0400	179.0400	179.0400	179.0400	179.0400	179.0400	179.0400 (216)
Fuel for water heating, kWh/month	127.5092	112.7868	119.9435	105.8252	102.8182	92.9102	91.9169	95.4383	96.3374	107.1049	113.4856	126.1715 (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	37.1856	29.8317	26.8601	19.6789	15.2005	12.4190	13.8664	18.0241	23.4115	30.7172	34.6950	38.2191 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-89.1068	-127.6425	-181.2094	-197.6642	-207.9995	-191.5544	-189.6688	-183.2054	-167.8739	-144.8960	-98.9909	-76.8216 (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	-17.2238	-43.7523	-96.3651	-156.3528	-215.8068	-220.0701	-218.6102	-182.1531	-130.9056	-70.1479	-25.9000	-13.0131 (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												212.0847 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												179.0400
Water heating fuel used												1292.2476 (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)												300.1093 (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												-1442.4926 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	212.0847	16.4900	34.9728 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1292.2476	16.4900	213.0916 (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	300.1093	16.4900	49.4880 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1856.6335	16.4900	-306.1589
PV Unit electricity exported	-1390.3008	5.5900	-77.7178
Total			-383.8767 (252)
Total energy cost			-86.3242 (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] =	-0.2616 (257)
SAP value		104.2404
SAP rating (Section 12)		104 (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	212.0847	0.1576	33.4318 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1292.2476	0.1408	181.9490 (264)
Space and water heating			215.3808 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	300.1093	0.1443	43.3150 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1856.6335	0.1350	-250.6090
PV Unit electricity exported	-1390.3008	0.1235	-171.7143
Total			-422.3232 (269)
Total CO2, kg/year			-163.6274 (272)
CO2 emissions per m2			-2.2200 (273)
EI value			101.8456
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	73.8000 (1b)	3.0000 (2b)	221.4000 (1b) - (3b)
Ground floor			(4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.8000		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 221.4000 (5)
Dwelling volume			

2. Ventilation rate

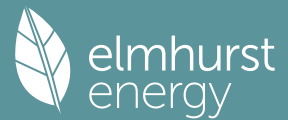
	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number 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) = 0.0452 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.5000 (17)
Infiltration rate	0.2702 (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) = 0.2094 (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	0.2251	0.2251	0.2251	0.2041	0.2094	0.1780	0.1727	0.1727	0.1780	0.2041	0.2041	0.2041 (22b)
Effective ac	0.5253	0.5253	0.5253	0.5208	0.5219	0.5158	0.5149	0.5149	0.5158	0.5208	0.5208	0.5208 (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	35.7000	9.3400	26.3600	0.1200	3.1632	190.0000	5008.4000	(29a)					
Total net area of external elements Aum(A, m2)			35.7000					(31)					
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		15.5458			(33)					
Main dwelling													
Party Wall 1			72.0900	0.0000	0.0000	20.0000	1441.8000	(32)					
Party Floor 1			73.8000			40.0000	2952.0000	(32d)					
Party Ceiling 1			73.8000			30.0000	2214.0000	(32b)					
Internal Wall 1			48.4800			9.0000	436.3200	(32c)					
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	12052.5200	(34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							163.3133	(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) =	15.5458	(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	
	38.3817	38.3817	38.3817	38.0534	38.1325	37.6881	37.6210	37.6210	37.6881	38.0534	38.0534	38.0534	(38)

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Heat transfer coeff	53.9275	53.9275	53.9275	53.5992	53.6783	53.2339	53.1668	53.1668	53.2339	53.5992	53.5992	53.5992 (39)
Average = Sum(39)m / 12 =												53.5549
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.7307	0.7307	0.7307	0.7263	0.7273	0.7213	0.7204	0.7204	0.7213	0.7263	0.7263	0.7263 (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												2.3347 (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												
73.0552	71.9702	70.4423	67.6252	65.5158	63.1768	61.9134	63.4305	65.0825	67.5853	70.4604	72.8082	(42b)
Hot water usage for other uses												
38.5400	37.1386	35.7371	34.3357	32.9342	31.5328	31.5328	32.9342	34.3357	35.7371	37.1386	38.5400	(42c)
Average daily hot water use (litres/day)												102.7701 (43)

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
111.5952	109.1088	106.1795	101.9609	98.4500	94.7095	93.4461	96.3648	99.4182	103.3224	107.5990	111.3482	(44)
Energy conte	176.7395	155.3695	163.1939	139.5794	132.5326	116.4564	113.0150	119.3197	122.5925	140.2076	153.2945	174.3444 (45)
Energy content (annual)										Total = Sum(45)m =		1706.6451
Distribution loss (46)m = 0.15 x (45)m												
26.5109	23.3054	24.4791	20.9369	19.8799	17.4685	16.9522	17.8980	18.3889	21.0311	22.9942	26.1517	(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	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month												
228.2925	201.9335	214.7469	189.4694	184.0856	166.3464	164.5680	170.8727	172.4825	191.7606	203.1845	225.8974	(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												
228.2925	201.9335	214.7469	189.4694	184.0856	166.3464	164.5680	170.8727	172.4825	191.7606	203.1845	225.8974	(64)
Total per year (kWh/year) = Sum(64)m =												2313.6401 (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												
100.0083	88.9115	95.5044	86.3221	85.3095	78.6338	78.8199	80.9162	80.6740	87.8614	90.8824	99.2119	(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	140.0842	140.0842	140.0842	140.0842	140.0842	140.0842	140.0842	140.0842	140.0842	140.0842	140.0842	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
42.4836	37.7335	30.6870	23.2320	17.3662	14.6613	15.8420	20.5921	27.6386	35.0936	40.9594	43.6643	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
307.4609	310.6514	302.6114	285.4954	263.8895	243.5830	230.0170	226.8266	234.8665	251.9825	273.5884	293.8949	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
51.3432	51.3432	51.3432	51.3432	51.3432	51.3432	51.3432	51.3432	51.3432	51.3432	51.3432	51.3432	(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)												
-93.3895	-93.3895	-93.3895	-93.3895	-93.3895	-93.3895	-93.3895	-93.3895	-93.3895	-93.3895	-93.3895	-93.3895	(71)
Water heating gains (Table 5)												
134.4198	132.3088	128.3661	119.8919	114.6633	109.2136	105.9407	108.7583	112.0472	118.0933	126.2256	133.3494	(72)
Total internal gains												
582.4021	578.7317	559.7024	526.6572	493.9570	465.4958	449.8377	454.2149	472.5903	503.2073	538.8113	568.9465	(73)

6. Solar gains												

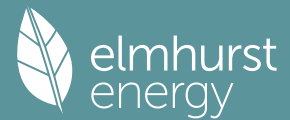
[Jan]			Area	Solar flux	g	FF	Access	Gains				
			m2	Table 6a	Specific data	Specific data	factor	W				
				W/m2	or Table 6b	or Table 6c	Table 6d					
South			9.3400	39.5594	0.6300	0.7000	0.7700	112.9195	(78)			

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	695.3216	773.0047	820.7053	830.8246	801.3547	766.8464	738.5743	730.7434	753.2995	728.2265	682.6150	673.2776 (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
62.0819	62.0819	62.0819	62.0819	62.4622	62.3701	62.8908	62.9702	62.9702	62.8908	62.4622	62.4622	62.4622
alpha	5.1388	5.1388	5.1388	5.1641	5.1580	5.1927	5.1980	5.1980	5.1927	5.1641	5.1641	5.1641
util living area												
0.9128	0.8656	0.7969	0.6886	0.5437	0.3870	0.2876	0.3051	0.4549	0.6837	0.8554	0.9221	(86)
Living	20.4898	20.6391	20.7863	20.9128	20.9780	20.9970	20.9995	20.9993	20.9926	20.9267	20.7112	20.4579
Non living	19.7395	19.9175	20.0890	20.2332	20.2986	20.3202	20.3226	20.3225	20.3168	20.2499	20.0100	19.7043
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	20.7390	20.6391	20.7863	20.9128	20.9780	20.9970	20.9995	20.9993	20.9926	20.9267	20.7112	20.5337 (87)
Th 2	20.3138	20.3138	20.3138	20.3177	20.3167	20.3220	20.3228	20.3228	20.3220	20.3177	20.3177	20.3177 (88)
util rest of house	0.8999	0.8478	0.7728	0.6561	0.5023	0.3408	0.2391	0.2562	0.4090	0.6461	0.8339	0.9103 (89)
MIT 2	20.0848	19.9175	20.0890	20.2332	20.2986	20.3202	20.3226	20.3225	20.3168	20.2499	20.0100	19.8149 (90)
Living area fraction									fLA = Living area / (4) =			0.2856 (91)
MIT	20.2717	20.1236	20.2882	20.4274	20.4926	20.5135	20.5159	20.5158	20.5098	20.4432	20.2103	20.0202 (92)
Temperature adjustment												0.0000
adjusted MIT	20.2717	20.1236	20.2882	20.4274	20.4926	20.5135	20.5159	20.5158	20.5098	20.4432	20.2103	20.0202 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.8990	0.8425	0.7719	0.6614	0.5131	0.3539	0.2529	0.2701	0.4218	0.6532	0.8302	0.9046 (94)
Useful gains	625.1153	651.2932	633.4749	549.5339	411.1731	271.3982	186.8210	197.3968	317.7590	475.6712	566.7097	609.0612 (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	823.5636	783.2223	711.2055	580.3378	418.2951	272.2101	186.9315	197.5575	319.9259	500.7901	670.5403	810.4308 (97)
Space heating kWh	147.6455	88.6564	57.8315	22.1788	5.2988	0.0000	0.0000	0.0000	0.0000	18.6884	74.7581	149.8190 (98a)
Space heating requirement - total per year (kWh/year)												564.8765
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	147.6455	88.6564	57.8315	22.1788	5.2988	0.0000	0.0000	0.0000	0.0000	18.6884	74.7581	149.8190 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												564.8765
Space heating per m2										(98c) / (4) =		7.6542 (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 %)												306.4201 (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	147.6455	88.6564	57.8315	22.1788	5.2988	0.0000	0.0000	0.0000	0.0000	18.6884	74.7581	149.8190 (98)
Space heating efficiency (main heating system 1)	306.4201	306.4201	306.4201	306.4201	306.4201	0.0000	0.0000	0.0000	0.0000	306.4201	306.4201	306.4201 (210)
Space heating fuel (main heating system)	48.1840	28.9330	18.8733	7.2381	1.7293	0.0000	0.0000	0.0000	0.0000	6.0990	24.3972	48.8934 (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	228.2925	201.9335	214.7469	189.4694	184.0856	166.3464	164.5680	170.8727	172.4825	191.7606	203.1845	225.8974 (64)
Efficiency of water heater	179.0400	179.0400	179.0400	179.0400	179.0400	179.0400	179.0400	179.0400	179.0400	179.0400	179.0400	179.0400 (216)
Fuel for water heating, kWh/month	127.5092	112.7868	119.9435	105.8252	102.8182	92.9102	91.9169	95.4383	96.3374	107.1049	113.4856	126.1715 (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	37.1856	29.8317	26.8601	19.6789	15.2005	12.4190	13.8664	18.0241	23.4115	30.7172	34.6950	38.2191 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-76.9889	-116.3215	-173.2080	-193.5621	-201.8270	-188.1559	-184.8510	-176.6839	-164.7104	-140.1742	-91.4182	-70.2394 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-12.9831	-36.0295	-87.0181	-148.6544	-195.4914	-204.9456	-197.5054	-160.7491	-123.6767	-65.0950	-22.1190	-11.0396 (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												184.3471 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												179.0400
Water heating fuel used												1292.2476 (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)												300.1093 (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												-1266.7434 (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	184.3471	28.4300	52.4099 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1292.2476	28.4300	367.3860 (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	300.1093	28.4300	85.3211 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1778.1405	28.4300	-505.5253
PV Unit electricity exported	-1265.3070	5.8100	-73.5143
Total			-579.0397 (252)
Total energy cost			-73.9227 (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	184.3471	0.1579	29.1172 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1292.2476	0.1408	181.9490 (264)
Space and water heating			211.0663 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	300.1093	0.1443	43.3150 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1778.1405	0.1346	-239.2793
PV Unit electricity exported	-1265.3070	0.1232	-155.9258
Total			-395.2051 (269)
Total CO2, kg/year			-140.8238 (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	184.3471	1.5847	292.1286 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1292.2476	1.5206	1965.0227 (278)
Space and water heating			2257.1513 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	300.1093	1.5338	460.3177 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1778.1405	1.4974	-2662.5011
PV Unit electricity exported	-1265.3070	0.4523	-572.3558
Total			-3234.8569 (283)
Total Primary energy kWh/year			-517.3879 (286)

SAP 10 EPC IMPROVEMENTS

2 BED

Current energy efficiency rating: A 104
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 (none)	Typical annual savings		Energy efficiency	Environmental impact
	Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: A 104
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):

	Current £505	Potential £505	£0	Saving
Electricity				
Space heating	£52	£52	£0	
Water heating	£367	£367	£0	
Lighting	£85	£85	£0	
Generated (PV)	-£579	-£579	£0	
Total cost of fuels	-£74	-£74	£0	
Total cost of uses	-£75	-£75	£0	
Delivered energy	-17 kWh/m²	-17 kWh/m²	0 kWh/m²	
Carbon dioxide emissions	-0.1 tonnes	-0.1 tonnes	0.0 tonnes	
CO2 emissions per m²	-2 kg/m²	-2 kg/m²	0 kg/m²	
Primary energy	-7 kWh/m²	-7 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

Main dwelling		Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	73.8000 (1b)	x	3.0000 (2b)	= 221.4000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.8000			(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	221.4000 (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) =	0.0452 (8)	
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		4.5000 (17)	
Infiltration rate		0.2702 (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) =	0.2094 (21)	

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	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)
Adj infilt rate	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)
Effective ac	0.2670	0.2617	0.2565	0.2303	0.2251	0.1989	0.1989	0.1937	0.2094	0.2251	0.2356	0.2460 (22b)
	0.5356	0.5342	0.5329	0.5265	0.5253	0.5198	0.5198	0.5188	0.5219	0.5253	0.5277	0.5303 (25)

3. Heat losses and heat loss parameter

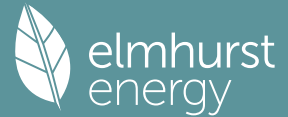
Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
GLAZING			9.3400	1.3258	12.3826		(27)
External Wall 1	35.7000	9.3400	26.3600	0.1200	3.1632	190.0000	5008.4000 (29a)
Total net area of external elements Aum(A, m ²)			35.7000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	15.5458		(33)
Main dwelling							
Party Wall 1			72.0900	0.0000	0.0000	20.0000	1441.8000 (32)
Party Floor 1			73.8000			40.0000	2952.0000 (32d)
Party Ceiling 1			73.8000			30.0000	2214.0000 (32b)
Internal Wall 1			48.4800			9.0000	436.3200 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	12052.5200 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							163.3133 (35)
List of Thermal Bridges							
K1 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) =	15.5458 (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	39.1345	39.0334	38.9343	38.4688	38.3817	37.9764	37.9764	37.9013	38.1325	38.3817	38.5579	38.7421 (38)
Average = Sum(39)m / 12 =	54.6802	54.5791	54.4800	54.0146	53.9275	53.5221	53.5221	53.4471	53.6783	53.9275	54.1037	54.2879 (39)
												54.0142
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.7409	0.7396	0.7382	0.7319	0.7307	0.7252	0.7252	0.7242	0.7273	0.7307	0.7331	0.7356 (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												2.3347 (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	73.0552	71.9702	70.4423	67.6252	65.5158	63.1768	61.9134	63.4305	65.0825	67.5853	70.4604	72.8082 (42b)
Average daily hot water use (litres/day)	38.5400	37.1386	35.7371	34.3357	32.9342	31.5328	31.5328	32.9342	34.3357	35.7371	37.1386	38.5400 (42c)
												102.7701 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

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Energy content (annual)	111.5952	109.1088	106.1795	101.9609	98.4500	94.7095	93.4461	96.3648	99.4182	103.3224	107.5990	111.3482 (44)
Distribution loss (46)m = 0.15 x (45)m	176.7395	155.3695	163.1939	139.5794	132.5326	116.4564	113.0150	119.3197	122.5925	140.2076	153.2945	174.3444 (45)
Water storage loss (or HIU loss):	26.5109	23.3054	24.4791	20.9369	19.8799	17.4685	16.9522	17.8980	18.3889	21.0311	22.9942	26.1517 (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	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	228.2925	201.9335	214.7469	189.4694	184.0856	166.3464	164.5680	170.8727	172.4825	191.7606	203.1845	225.8974 (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	228.2925	201.9335	214.7469	189.4694	184.0856	166.3464	164.5680	170.8727	172.4825	191.7606	203.1845	225.8974 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Heat gains from water heating, kWh/month	100.0083	88.9115	95.5044	86.3221	85.3095	78.6338	78.8199	80.9162	80.6740	87.8614	90.8824	99.2119 (65)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000 (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	140.0842	140.0842	140.0842	140.0842	140.0842	140.0842	140.0842	140.0842	140.0842	140.0842	140.0842	140.0842 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	42.4836	37.7335	30.6870	23.2320	17.3662	14.6613	15.8420	20.5921	27.6386	35.0936	40.9594	43.6643 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	307.4609	310.6514	302.6114	285.4954	263.8895	243.5830	230.0170	226.8266	234.8665	251.9825	273.5884	293.8949 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	51.3432	51.3432	51.3432	51.3432	51.3432	51.3432	51.3432	51.3432	51.3432	51.3432	51.3432	51.3432 (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)	-93.3895	-93.3895	-93.3895	-93.3895	-93.3895	-93.3895	-93.3895	-93.3895	-93.3895	-93.3895	-93.3895	-93.3895 (71)
Water heating gains (Table 5)	134.4198	132.3088	128.3661	119.8919	114.6633	109.2136	105.9407	108.7583	112.0472	118.0933	126.2256	133.3494 (72)
Total internal gains	582.4021	578.7317	559.7024	526.6572	493.9570	465.4958	449.8377	454.2149	472.5903	503.2073	538.8113	568.9465 (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	715.8524	797.2888	838.1055	841.3131	821.8479	781.0462	758.1496	753.6285	763.4151	738.9417	696.9954	684.2598 (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	61.2273	61.3407	61.4523	61.9818	62.0819	62.5521	62.5521	62.6400	62.3701	62.0819	61.8797	61.6698
alpha	5.0818	5.0894	5.0968	5.1321	5.1388	5.1701	5.1701	5.1760	5.1580	5.1388	5.1253	5.1113
util living area	0.9188	0.8736	0.8103	0.7166	0.5905	0.4351	0.3101	0.3256	0.4791	0.7046	0.8668	0.9305 (86)
Living	20.4304	20.5935	20.7526	20.8867	20.9637	20.9939	20.9991	20.9989	20.9896	20.9102	20.6695	20.3851
Non living	19.6586	19.8554	20.0436	20.2002	20.2819	20.3144	20.3182	20.3189	20.3091	20.2288	19.9550	19.6075
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	20.7086	20.5935	20.7526	20.8867	20.9637	20.9939	20.9991	20.9989	20.9896	20.9102	20.6695	20.4711 (87)
Th 2	20.3048	20.3060	20.3072	20.3127	20.3138	20.3186	20.3186	20.3195	20.3167	20.3138	20.3117	20.3095 (88)
util rest of house	0.9070	0.8572	0.7877	0.6861	0.5517	0.3900	0.2623	0.2777	0.4337	0.6688	0.8471	0.9201 (89)
MIT 2	20.0472	19.8554	20.0436	20.2002	20.2819	20.3144	20.3182	20.3189	20.3091	20.2288	19.9550	19.7340 (90)
Living area fraction									fLA = Living area / (4) =			0.2856 (91)
MIT	20.2361	20.0662	20.2462	20.3963	20.4767	20.5085	20.5127	20.5131	20.5035	20.4234	20.1591	19.9445 (92)
Temperature adjustment												0.0000
adjusted MIT	20.2361	20.0662	20.2462	20.3963	20.4767	20.5085	20.5127	20.5131	20.5035	20.4234	20.1591	19.9445 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	648.4076	678.5271	658.4240	580.4489	461.1135	314.4713	209.2194	219.5702	340.6244	498.5963	587.1372	625.3576 (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	871.3910	827.7587	748.8912	620.9678	473.3039	316.2337	209.4153	219.8351	343.7297	529.7534	706.5460	854.7363 (97)
Space heating kWh	165.8996	100.2836	67.3076	29.1736	9.0697	0.0000	0.0000	0.0000	0.0000	23.1809	85.9743	170.6577 (98a)
Space heating requirement - total per year (kWh/year)												651.5471

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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	165.8996	100.2836	67.3076	29.1736	9.0697	0.0000	0.0000	0.0000	0.0000	23.1809	85.9743	170.6577 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												651.5471
Space heating per m2										(98c) / (4) =		8.8286 (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 %)												307.2107 (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	165.8996	100.2836	67.3076	29.1736	9.0697	0.0000	0.0000	0.0000	0.0000	23.1809	85.9743	170.6577 (98)
Space heating efficiency (main heating system 1)	307.2107	307.2107	307.2107	307.2107	307.2107	0.0000	0.0000	0.0000	0.0000	307.2107	307.2107	307.2107 (210)
Space heating fuel (main heating system)	54.0019	32.6433	21.9093	9.4963	2.9523	0.0000	0.0000	0.0000	0.0000	7.5456	27.9855	55.5507 (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 requirement	228.2925	201.9335	214.7469	189.4694	184.0856	166.3464	164.5680	170.8727	172.4825	191.7606	203.1845	225.8974 (64)
Efficiency of water heater (217)m	179.0400	179.0400	179.0400	179.0400	179.0400	179.0400	179.0400	179.0400	179.0400	179.0400	179.0400	179.0400 (216)
Fuel for water heating, kWh/month	127.5092	112.7868	119.9435	105.8252	102.8182	92.9102	91.9169	95.4383	96.3374	107.1049	113.4856	126.1715 (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	37.1856	29.8317	26.8601	19.6789	15.2005	12.4190	13.8664	18.0241	23.4115	30.7172	34.6950	38.2191 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-89.1068	-127.6425	-181.2094	-197.6642	-207.9995	-191.5544	-189.6688	-183.2054	-167.8739	-144.8960	-98.9909	-76.8216 (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	-17.2238	-43.7523	-96.3651	-156.3528	-215.8068	-220.0701	-218.6102	-182.1531	-130.9056	-70.1479	-25.9000	-13.0131 (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												212.0847 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												179.0400
Water heating fuel used												1292.2476 (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)												300.1093 (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												-1442.4926 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	212.0847	16.4900	34.9728 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1292.2476	16.4900	213.0916 (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	300.1093	16.4900	49.4880 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1856.6335	16.4900	-306.1589
PV Unit electricity exported	-1390.3008	5.5900	-77.7178
Total			-383.8767 (252)
Total energy cost			-86.3242 (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] =	-0.2616 (257)
SAP value		104.2404

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SAP rating (Section 12)
SAP band

104 (258)
A

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	212.0847	0.1576	33.4318	(261)
Total CO ₂ associated with community systems			0.0000	(373)
Water heating (other fuel)	1292.2476	0.1408	181.9490	(264)
Space and water heating			215.3808	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	300.1093	0.1443	43.3150	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1856.6335	0.1350	-250.6090	
PV Unit electricity exported	-1390.3008	0.1235	-171.7143	
Total			-422.3232	(269)
Total CO ₂ , kg/year			-163.6274	(272)
CO ₂ emissions per m ²			-2.2200	(273)
EI value			101.8456	
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 (m ²)	Storey height (m)	Volume (m ³)	
Main dwelling	73.8000	3.0000	221.4000	(1b) - (3b)
Ground floor				
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.8000			(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	221.4000	(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) =	0.0452 (8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		4.5000	(17)
Infiltration rate		0.2702	(18)
Number of sides sheltered		3	(19)

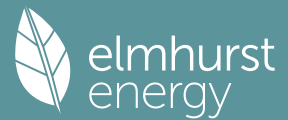
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2094	(21)

	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	0.2251	0.2251	0.2251	0.2041	0.2094	0.1780	0.1727	0.1727	0.1780	0.2041	0.2041	0.2041	(22b)
Effective ac	0.5253	0.5253	0.5253	0.5208	0.5219	0.5158	0.5149	0.5149	0.5158	0.5208	0.5208	0.5208	(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	35.7000	9.3400	26.3600	0.1200	3.1632	190.0000	5008.4000	(29a)
Total net area of external elements Aum(A, m ²)			35.7000					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	15.5458		(33)
Main dwelling								
Party Wall 1			72.0900	0.0000	0.0000	20.0000	1441.8000	(32)
Party Floor 1			73.8000			40.0000	2952.0000	(32d)
Party Ceiling 1			73.8000			30.0000	2214.0000	(32b)
Internal Wall 1			48.4800			9.0000	436.3200	(32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	12052.5200	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							163.3133	(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) =	15.5458 (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	38.3817	38.3817	38.3817	38.0534	38.1325	37.6881	37.6210	37.6210	37.6881	38.0534	38.0534	38.0534	(38)
Heat transfer coeff	53.9275	53.9275	53.9275	53.5992	53.6783	53.2339	53.1668	53.1668	53.2339	53.5992	53.5992	53.5992	(39)
Average = Sum(39)m / 12 =												53.5549	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7307	0.7307	0.7307	0.7263	0.7273	0.7213	0.7204	0.7204	0.7213	0.7263	0.7263	0.7263	(40)
HLP (average)												0.7257	(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													2.3347 (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	(42a)
Hot water usage for baths													(42b)
73.0552	71.9702	70.4423	67.6252	65.5158	63.1768	61.9134	63.4305	65.0825	67.5853	70.4604	72.8082	72.8082	(42b)
Hot water usage for other uses													(42c)
38.5400	37.1386	35.7371	34.3357	32.9342	31.5328	31.5328	32.9342	34.3357	35.7371	37.1386	38.5400	38.5400	(42c)
Average daily hot water use (litres/day)												102.7701	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	111.5952	109.1088	106.1795	101.9609	98.4500	94.7095	93.4461	96.3648	99.4182	103.3224	107.5990	111.3482	(44)
Energy conte	176.7395	155.3695	163.1939	139.5794	132.5326	116.4564	113.0150	119.3197	122.5925	140.2076	153.2945	174.3444	(45)
Energy content (annual)										Total =	Sum(45)m =	1706.6451	(45)
Distribution loss (46)m = 0.15 x (45)m													(46)
26.5109	23.3054	24.4791	20.9369	19.8799	17.4685	16.9522	17.8980	18.3889	21.0311	22.9942	26.1517	26.1517	(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													
228.2925	201.9335	214.7469	189.4694	184.0856	166.3464	164.5680	170.8727	172.4825	191.7606	203.1845	225.8974	225.8974	(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													
228.2925	201.9335	214.7469	189.4694	184.0856	166.3464	164.5680	170.8727	172.4825	191.7606	203.1845	225.8974	225.8974	(64)
Total per year (kWh/year) = Sum(64)m =												2313.6401	(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													
100.0083	88.9115	95.5044	86.3221	85.3095	78.6338	78.8199	80.9162	80.6740	87.8614	90.8824	99.2119	99.2119	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	140.0842	140.0842	140.0842	140.0842	140.0842	140.0842	140.0842	140.0842	140.0842	140.0842	140.0842	140.0842	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
42.4836	37.7335	30.6870	23.2320	17.3662	14.6613	15.8420	20.5921	27.6386	35.0936	40.9594	43.6643	43.6643	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
307.4609	310.6514	302.6114	285.4954	263.8895	243.5830	230.0170	226.8266	234.8665	251.9825	273.5884	293.8949	293.8949	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
51.3432	51.3432	51.3432	51.3432	51.3432	51.3432	51.3432	51.3432	51.3432	51.3432	51.3432	51.3432	51.3432	(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)													
-93.3895	-93.3895	-93.3895	-93.3895	-93.3895	-93.3895	-93.3895	-93.3895	-93.3895	-93.3895	-93.3895	-93.3895	-93.3895	(71)
Water heating gains (Table 5)													
134.4198	132.3088	128.3661	119.8919	114.6633	109.2136	105.9407	108.7583	112.0472	118.0933	126.2256	133.3494	133.3494	(72)
Total internal gains													
582.4021	578.7317	559.7024	526.6572	493.9570	465.4958	449.8377	454.2149	472.5903	503.2073	538.8113	568.9465	568.9465	(73)

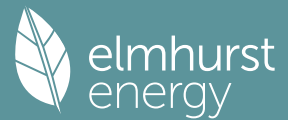
6. Solar gains

[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	695.3216	773.0047	820.7053	830.8246	801.3547	766.8464	738.5743	730.7434	753.2995	728.2265	682.6150	673.2776	(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	62.0819	62.0819	62.0819	62.4622	62.3701	62.8908	62.9702	62.9702	62.8908	62.4622	62.4622	62.4622	
alpha	5.1388	5.1388	5.1388	5.1641	5.1580	5.1927	5.1980	5.1980	5.1927	5.1641	5.1641	5.1641	
util living area													
0.9128	0.8656	0.7969	0.6886	0.5437	0.3870	0.2876	0.3051	0.4549	0.6837	0.8554	0.9221	0.9221	(86)

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Living	20.4898	20.6391	20.7863	20.9128	20.9780	20.9970	20.9995	20.9993	20.9926	20.9267	20.7112	20.4579
Non living	19.7395	19.9175	20.0890	20.2332	20.2986	20.3202	20.3226	20.3225	20.3168	20.2499	20.0100	19.7043
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	20.7390	20.6391	20.7863	20.9128	20.9780	20.9970	20.9995	20.9993	20.9926	20.9267	20.7112	20.5337 (87)
Th 2	20.3138	20.3138	20.3138	20.3177	20.3167	20.3220	20.3228	20.3228	20.3220	20.3177	20.3177	20.3177 (88)
util rest of house												
	0.8999	0.8478	0.7728	0.6561	0.5023	0.3408	0.2391	0.2562	0.4090	0.6461	0.8339	0.9103 (89)
MIT 2	20.0848	19.9175	20.0890	20.2332	20.2986	20.3202	20.3226	20.3225	20.3168	20.2499	20.0100	19.8149 (90)
Living area fraction									FLA = Living area / (4) =			0.2856 (91)
MIT	20.2717	20.1236	20.2882	20.4274	20.4926	20.5135	20.5159	20.5158	20.5098	20.4432	20.2103	20.0202 (92)
Temperature adjustment												0.0000
adjusted MIT	20.2717	20.1236	20.2882	20.4274	20.4926	20.5135	20.5159	20.5158	20.5098	20.4432	20.2103	20.0202 (93)

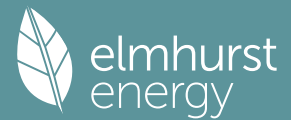
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8990	0.8425	0.7719	0.6614	0.5131	0.3539	0.2529	0.2701	0.4218	0.6532	0.8302	0.9046	(94)
Useful gains	625.1153	651.2932	633.4749	549.5339	411.1731	271.3982	186.8210	197.3968	317.7590	475.6712	566.7097	609.0612	(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	823.5636	783.2223	711.2055	580.3378	418.2951	272.2101	186.9315	197.5575	319.9259	500.7901	670.5403	810.4308	(97)
Space heating kWh	147.6455	88.6564	57.8315	22.1788	5.2988	0.0000	0.0000	0.0000	0.0000	18.6884	74.7581	149.8190	(98a)
Space heating requirement - total per year (kWh/year)												564.8765	
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	147.6455	88.6564	57.8315	22.1788	5.2988	0.0000	0.0000	0.0000	0.0000	18.6884	74.7581	149.8190	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												564.8765	
Space heating per m2										(98c) / (4) =		7.6542	(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 %)													306.4201	(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	147.6455	88.6564	57.8315	22.1788	5.2988	0.0000	0.0000	0.0000	0.0000	18.6884	74.7581	149.8190	(98)	
Space heating efficiency (main heating system 1)	306.4201	306.4201	306.4201	306.4201	306.4201	0.0000	0.0000	0.0000	0.0000	306.4201	306.4201	306.4201	(210)	
Space heating fuel (main heating system)	48.1840	28.9330	18.8733	7.2381	1.7293	0.0000	0.0000	0.0000	0.0000	6.0990	24.3972	48.8934	(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	228.2925	201.9335	214.7469	189.4694	184.0856	166.3464	164.5680	170.8727	172.4825	191.7606	203.1845	225.8974	(64)	
Efficiency of water heater (217)m	179.0400	179.0400	179.0400	179.0400	179.0400	179.0400	179.0400	179.0400	179.0400	179.0400	179.0400	179.0400	(216)	
Fuel for water heating, kWh/month	127.5092	112.7868	119.9435	105.8252	102.8182	92.9102	91.9169	95.4383	96.3374	107.1049	113.4856	126.1715	(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	37.1856	29.8317	26.8601	19.6789	15.2005	12.4190	13.8664	18.0241	23.4115	30.7172	34.6950	38.2191	(232)	
Electricity generated by PVs (Appendix M) (negative quantity)														
(233a)m	-76.9889	-116.3215	-173.2080	-193.5621	-201.8270	-188.1559	-184.8510	-176.6839	-164.7104	-140.1742	-91.4182	-70.2394	(233a)	
Electricity generated by wind turbines (Appendix M) (negative quantity)														
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)														
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)														
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)	
Electricity generated by PVs (Appendix M) (negative quantity)														
(233b)m	-12.9831	-36.0295	-87.0181	-148.6544	-195.4914	-204.9456	-197.5054	-160.7491	-123.6767	-65.0950	-22.1190	-11.0396	(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													184.3471	(211)
Space heating fuel - main system 2													0.0000	(213)
Space heating fuel - secondary													0.0000	(215)
Efficiency of water heater													179.0400	
Water heating fuel used													1292.2476	(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)													300.1093	(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													-1266.7434	(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	184.3471	28.4300	52.4099 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1292.2476	28.4300	367.3860 (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	300.1093	28.4300	85.3211 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1778.1405	28.4300	-505.5253
PV Unit electricity exported	-1265.3070	5.8100	-73.5143
Total			-579.0397 (252)
Total energy cost			-73.9227 (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	184.3471	0.1579	29.1172 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1292.2476	0.1408	181.9490 (264)
Space and water heating			211.0663 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	300.1093	0.1443	43.3150 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1778.1405	0.1346	-239.2793
PV Unit electricity exported	-1265.3070	0.1232	-155.9258
Total			-395.2051 (269)
Total CO2, kg/year			-140.8238 (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	184.3471	1.5847	292.1286 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1292.2476	1.5206	1965.0227 (278)
Space and water heating			2257.1513 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	300.1093	1.5338	460.3177 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1778.1405	1.4974	-2662.5011
PV Unit electricity exported	-1265.3070	0.4523	-572.3558
Total			-3234.8569 (283)
Total Primary energy kWh/year			-517.3879 (286)

Predicted Energy Assessment



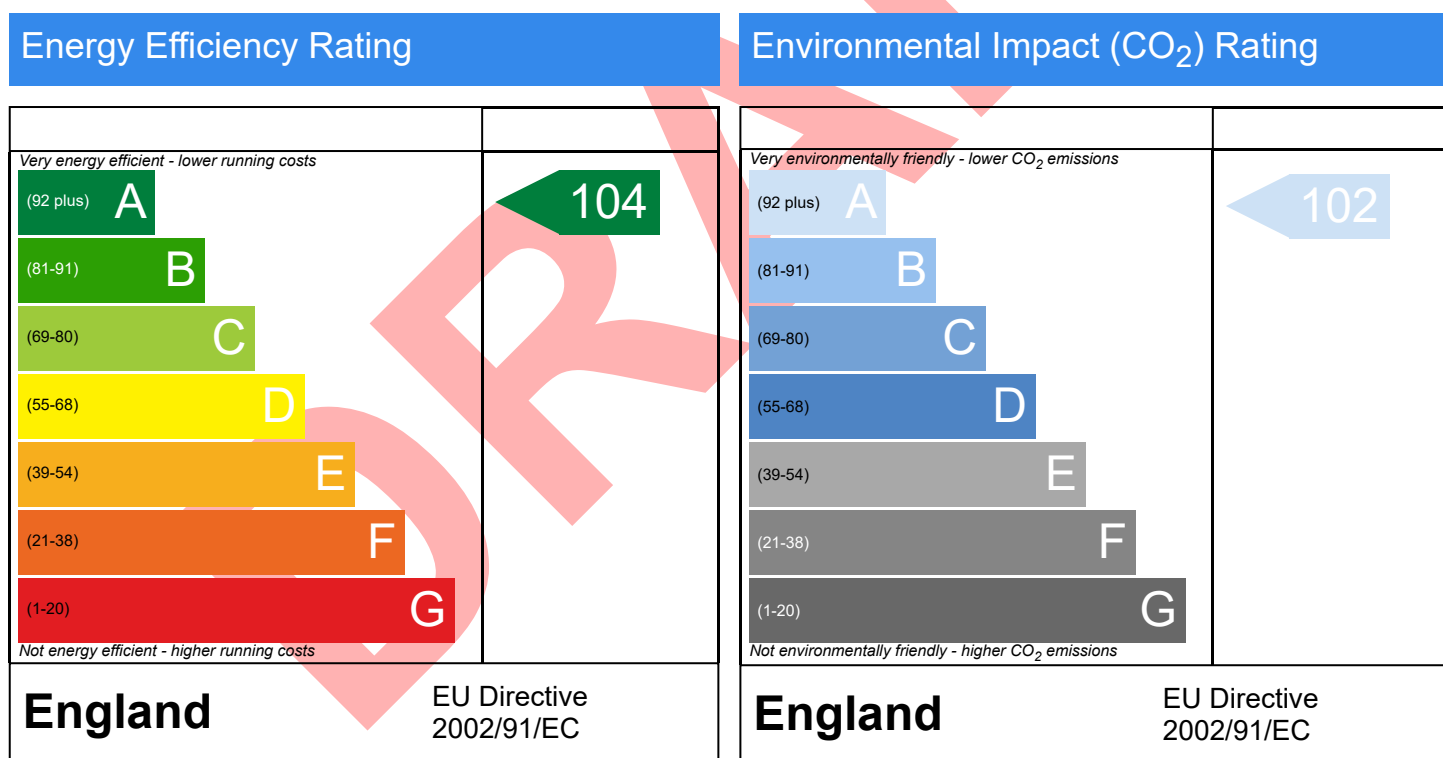
1295, Ashton Old Road, MANCHESTER, M11 1JS

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

Flat, Mid-Terrace
25/02/2026
10.2
George Achilleos
73.8 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	2 BED	Plot Type Ref	
Plot Address	1295, Ashton Old Road, MANCHESTER, M11 1JS	SAP Version	10.2

SAP Rating	104 A	DER	-2.13	TER	9.76
Environmental	102 A	% DER < TER			121.82
CO ₂ Emissions (t/year)	-0.14	DFEE	16.67	TFEE	16.99
Compliance Check	See BREL	% DFEE < TFEE			1.84
% DPER < TPER	115.46	DPER	-8.03	TPER	51.94

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	2	
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	163.31	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
		11.90 m	73.80 m ²	3.00 m

8.0 Living Area	21.08	m ²
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9.0 External Walls	Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area(m ²)	Nett Area (m ²)	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	35.70	26.36	2.10	Stairwell	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	72.09		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	73.80

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	73.80

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	2 BED	Plot Type Ref	Mid-Terrace Flat
Plot Address	1295, Ashton Old Road, MANCHESTER, M11 1JS	SAP Version	10.2

SAP Rating	104 A	DER	-2.13	TER	9.76
Environmental	102 A	% DER < TER			121.82
CO ₂ Emissions (t/year)	-0.14	DFEE	16.67	TFEE	16.99
Compliance Check	See BREL	% DFEE < TFEE			1.84
% DPER < TPER	115.46	DPER	-8.03	TPER	51.94

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



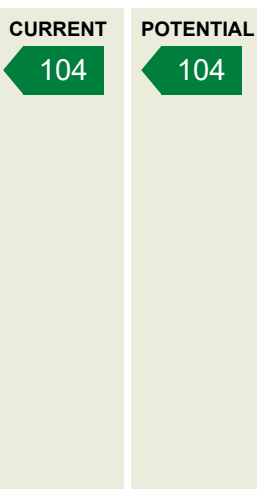
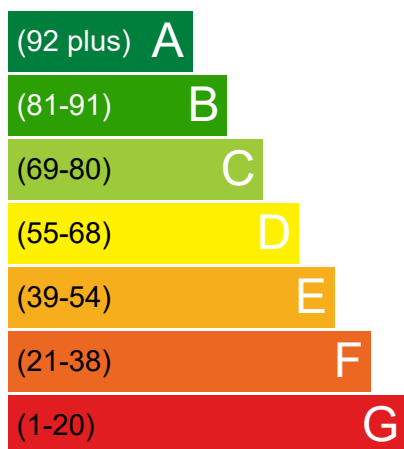
Dwelling Address	1295, Ashton Old Road, MANCHESTER, M11 1JS
Reference	M11 1JJ-2 BED
SAP Version	10.2
Assessment Date	25/02/2026
Submission Date	
Property Type	Flat, Mid-Terrace
Total Floor Area	74

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

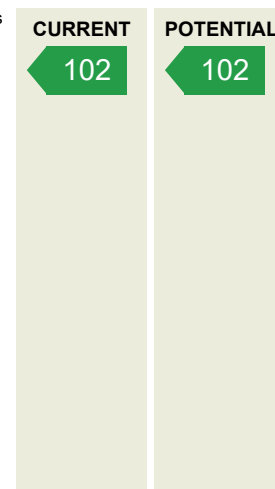
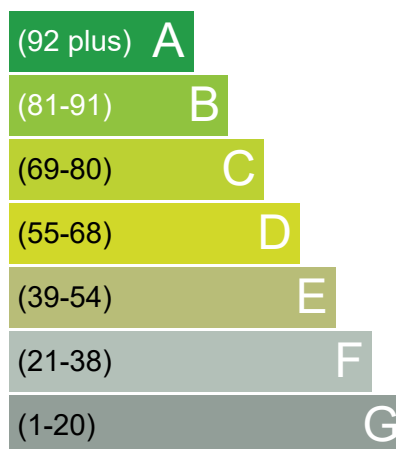
Energy Efficiency Rating

Most energy efficient - lower running costs



Carbon Dioxide (CO2) Emissions Rating

Very environmentally friendly - lower CO2 emissions



Additional ratings for your home

	Primary Energy	Energy	Carbon	Cost	HTC
CURRENT	-7.01 kWh	-1267 kWh	-141 kg	-73.92 £	54 W/K
POTENTIAL	-7.01 kWh	-1267 kWh	-141 kg	-73.92 £	54 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	Very Good
Main heating controls	Time and temperature zone control	Very Good
Secondary heating	None	
Hot water	From main system	Average
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		£85	£85	
Heating		£52	£52	
Hot Water		£367	£367	
New Technologies e.g. Impact of PV		-(£579)	-(£579)	
TOTAL		-(£74)	-(£74)	

Estimated energy use and potential savings



Space Heating

184

kWh per year



Water Heating

1292

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 (CO ₂)	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.