

Building Regulations England Part L (BREL) Compliance Report

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

Date: Tue 04 Aug 2026 10:49:07

Project Information			
Assessed By	Mike Ovenden	Building Type	House, Semi-detached
OCDEA Registration	EES/018685	Assessment Date	2026-08-04

Dwelling Details			
Assessment Type	As designed	Total Floor Area	112 m ²
Site Reference	Plot 2 134 High Street Kimpton	Plot Reference	design rev 2
Address			

Client Details	
Name	Alison Swarbrick
Company	Architecture Studio 5 Ltd
Address	5 Monmouth Road , Harlington , LU5 6NE

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

1a Target emission rate and dwelling emission rate			
Fuel for main heating system	Electricity		
Target carbon dioxide emission rate	10.44 kgCO ₂ /m ²		
Dwelling carbon dioxide emission rate	2.59 kgCO ₂ /m ²		OK
1b Target primary energy rate and dwelling primary energy			
Target primary energy	54.43 kWh _{PE} /m ²		
Dwelling primary energy	24.95 kWh _{PE} /m ²		OK
1c Target fabric energy efficiency and dwelling fabric energy efficiency			
Target fabric energy efficiency	40.2 kWh/m ²		
Dwelling fabric energy efficiency	37.0 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	0.18	Walls (1) (0.18)	OK
Party walls	0.2	0	Party Wall (1) (0)	N/A
Curtain walls	1.6	0	N/A	N/A
Floors	0.18	0.1	Heatloss Floor 2 (0.18)	OK
Roofs	0.16	0.12	Roof (1) (0.12)	OK
Windows, doors, and roof windows	1.6	1.22	windows front (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]
Exposed wall: Walls (1)	84.1315	0.18
Party wall: Party Wall (1)	68.68	0 (!)
Ground floor: Heatloss Floor 1, Heatloss Floor 1	56	0.1 (!)
Upper floor: Heatloss Floor 2, Heatloss Floor 2	1.75	0.18
Exposed roof: Roof (1)	56	0.12

2c Openings (better than typically expected values are flagged with a subsequent (!))				
Name	Area [m ²]	Orientation	Frame factor	U-Value [W/m ² K]
windows front, windows	3.12	South East	0.7	1.2
windows front, windows	2.61	South East	0.7	1.2
windows front, windows	2.61	South East	0.7	1.2
windows front, windows	0.63	South East	0.7	1.2
windows side, windows	0.9555	North East	0.7	1.2
windows side, windows	0.9555	North East	0.7	1.2
windows side, windows	1.4175	North East	0.7	1.2
windows side, windows	0.7245	North East	0.7	1.2
windows side, windows	0.8775	North East	0.7	1.2
windows rear, windows	2.61	North West	0.7	1.2
windows rear, windows	2.61	North West	0.7	1.2

Name	Area [m ²]	Orientation	Frame factor	U-Value [W/m ² K]
windows rear, windows	3.78	North West	0.7	1.2
windows rear, windows	0.945	North West	0.7	1.2
windows rear, windows	0.945	North West	0.7	1.2
windows side, windows	0.8775	South West	0.7	1.2
windows front, doors	2.1105	South East	N/A	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
External wall	E12: Gable (insulation at ceiling level)	Calculated by person with suitable expertise	0.043	cert supplied
External wall	E10: Eaves (insulation at ceiling level)	Calculated by person with suitable expertise	0.057	cert supplied
External wall	E21: Exposed floor (inverted)	SAP table default	0.32	
Party wall	P1: Ground floor	Calculated by person with suitable expertise	0.05	cert supplied
Party wall	P2: Intermediate floor within a dwelling	SAP table default	0 (!)	
Party wall	P4: Roof (insulation at ceiling level)	Calculated by person with suitable expertise	0.04	cert supplied
External wall	E16: Corner (normal)	Calculated by person with suitable expertise	0.042	cert supplied
External wall	E17: Corner (inverted - internal area greater than external area)	Calculated by person with suitable expertise	-0.085	cert supplied
External wall	E2: Other lintels (including other steel lintels)	Calculated by person with suitable expertise	0.025 (!)	cert supplied
External wall	E3: Sill	Calculated by person with suitable expertise	0.022 (!)	cert supplied
External wall	E4: Jamb	Calculated by person with suitable expertise	0.017 (!)	cert supplied
External wall	E5: Ground floor (normal)	Calculated by person with suitable expertise	0.075	cert supplied
External wall	E6: Intermediate floor within a dwelling	Calculated by person with suitable expertise	0.001 (!)	cert supplied
External wall	E18: Party wall between dwellings	Calculated by person with suitable expertise	0.033 (!)	cert supplied

3 Air permeability (better than typically expected values are flagged with a subsequent (!))

Maximum permitted air permeability at 50Pa	8 m ³ /hm ²	
Dwelling air permeability at 50Pa	5.1 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	371.0%
Emitter type	Both radiators and underfloor
Flow temperature	45°C
System type	Heat Pump
Manufacturer	Vaillant Group UK Ltd
Model	geoTHERM air 4kW
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	1.63 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: N/A		
Manufacturer		
Model		
7 Lighting		
Minimum permitted light source efficacy	75 lm/W	
Lowest light source efficacy	95 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	4.6 kWp	
Orientation	East	
Pitch	30°	
Overshading	Modest	
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:	Assessor ID:	
Name:	Date:	
b. Client Declaration		
N/A		

Full SAP Calculation Printout



Plot Reference	Plot 2 134 High Street Kimpton				Issued on Date	04/08/2026	
Assessment Reference	design rev 2			Plot Type Ref	Design		
Plot Address					SAP Version	10.2	
SAP Rating	90 B		DER	2.59		TER	10.44
Environmental	98 A		% DER < TER				75.19
CO ₂ Emissions (t/year)	0.23		DFEE	37.00		TFEE	40.25
Compliance Check	See BREL		% DFEE < TFEE				8.06
% DPER < TPER	54.16		DPER	24.95		TPER	54.43
Assessor Details	Mr. Mike Ovenden				Assessor ID	H824-0001	
Client	11, Alison Swarbrick						

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	56.0000 (1b)	x 2.4000 (2b)	= 134.4000 (1b) - (3b)
First floor	56.0000 (1c)	x 2.6500 (2c)	= 148.4000 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	112.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 282.8000 (5)

2. Ventilation rate

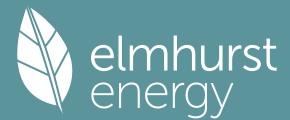
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	5 * 10 = 50.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	Air changes per hour 50.0000 / (5) = 0.1768 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.1000 (17)
Infiltration rate	0.4318 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3994 (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	0.5093	0.4993	0.4893	0.4394	0.4294	0.3794	0.3794	0.3695	0.3994	0.4294	0.4493	0.4693 (22b)
Effective ac	0.6297	0.6246	0.6197	0.5965	0.5922	0.5720	0.5720	0.5683	0.5798	0.5922	0.6010	0.6101 (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							
windows			25.6700	1.1450	29.3931		(27)
doors			2.1100	1.4000	2.9540		(26)
Heatloss Floor 1			56.0000	0.1000	5.6000	75.0000	4200.0000 (28a)
Heatloss Floor 2			1.7500	0.1800	0.3150	20.0000	35.0000 (28b)
External Wall 1	111.9100	27.7800	84.1300	0.1800	15.1434	140.0000	11778.2000 (29a)
External Roof 1	56.0000		56.0000	0.1200	6.7200	9.0000	504.0000 (30)
Total net area of external elements Aum (A, m ²)			225.6600				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	60.1255		(33)
Main dwelling							
Party Wall 1			68.6800	0.0000	0.0000	140.0000	9615.2000 (32)
Internal Wall 1			208.5700			9.0000	1877.1300 (32c)
Internal Floor 1			56.0000			18.0000	1008.0000 (32d)
Internal Ceiling 1			56.0000			9.0000	504.0000 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	29521.5300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							263.5851 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E12 Gable (insulation at ceiling level)				5.0600	0.0430	0.2176	

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E10 Eaves (insulation at ceiling level)	18.6000	0.0570	1.0602
E21 Exposed floor (inverted)	3.0000	0.3200	0.9600
P1 Party wall - Ground floor	12.4000	0.0500	0.6200
P2 Party wall - Intermediate floor within a dwelling	12.4000	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	12.4000	0.0400	0.4960
E16 Corner (normal)	17.3000	0.0420	0.7266
E17 Corner (inverted - internal area greater than external area)	7.2000	-0.0850	-0.6120
E2 Other lintels (including other steel lintels)	19.6600	0.0250	0.4915
E3 Sill	18.6600	0.0220	0.4105
E4 Jamb	44.8000	0.0170	0.7616
E5 Ground floor (normal)	23.0000	0.0750	1.7250
E6 Intermediate floor within a dwelling	21.4000	0.0010	0.0214
E18 Party wall between dwellings	10.1000	0.0330	0.3333
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			7.2117 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	67.3372 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	58.7635	58.2936	57.8330	55.6695	55.2647	53.3804	53.3804	53.0315	54.1062	55.2647	56.0836	56.9397	(38)
Heat transfer coeff	126.1007	125.6308	125.1702	123.0067	122.6020	120.7176	120.7176	120.3687	121.4434	122.6020	123.4208	124.2769	(39)
Average = Sum(39)m / 12 =												123.0048	
HLP	1.1259	1.1217	1.1176	1.0983	1.0947	1.0778	1.0778	1.0747	1.0843	1.0947	1.1020	1.1096	(40)
HLP (average)												1.0983	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.8263 (42)
Hot water usage for mixer showers	98.4607	96.9810	94.8249	90.6994	87.6549	84.2598	82.3299	84.4698	86.8155	90.4609	94.6749	98.0835	(42a)
Hot water usage for baths	30.9169	30.4578	29.8112	28.6190	27.7263	26.7364	26.2017	26.8438	27.5429	28.6021	29.8188	30.8124	(42b)
Hot water usage for other uses	43.5743	41.9897	40.4052	38.8207	37.2362	35.6517	35.6517	37.2362	38.8207	40.4052	41.9897	43.5743	(42c)
Average daily hot water use (litres/day)												159.0553	(43)
Daily hot water use	172.9519	169.4285	165.0412	158.1391	152.6174	146.6478	144.1833	148.5498	153.1791	159.4682	166.4835	172.4701	(44)
Energy conte	273.9135	241.2640	253.6623	216.4845	205.4523	180.3206	174.3772	183.9356	188.8851	216.3968	237.1863	270.0465	(45)
Energy content (annual)										Total = Sum(45)m =		2641.9247	
Distribution loss (46)m = 0.15 x (45)m	41.0870	36.1896	38.0493	32.4727	30.8178	27.0481	26.1566	27.5903	28.3328	32.4595	35.5779	40.5070	(46)
Water storage loss (or HIU loss):													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6300	(48)
Temperature factor from Table 2b												0.7800	(49)
Enter (49) or (54) in (55)												1.2714	(55)
Total storage loss	39.4134	35.5992	39.4134	38.1420	39.4134	38.1420	39.4134	39.4134	38.1420	39.4134	38.1420	39.4134	(56)
If cylinder contains dedicated solar storage	39.4134	35.5992	39.4134	38.1420	39.4134	38.1420	39.4134	39.4134	38.1420	39.4134	38.1420	39.4134	(57)
Primary loss	54.8576	49.5488	54.8576	53.0880	54.8576	22.5120	23.2624	23.2624	22.5120	54.8576	53.0880	54.8576	(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	368.1845	326.4120	347.9333	307.7145	299.7233	240.9746	237.0530	246.6114	249.5391	310.6678	328.4163	364.3175	(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	368.1845	326.4120	347.9333	307.7145	299.7233	240.9746	237.0530	246.6114	249.5391	310.6678	328.4163	364.3175	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		3627.5473	(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	134.9623	119.8593	128.2288	114.4515	112.1990	77.9662	76.5903	79.7685	80.8139	115.8380	121.3348	133.6766	(65)

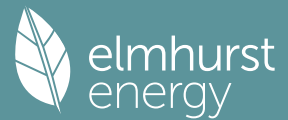
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	141.3156	141.3156	141.3156	141.3156	141.3156	141.3156	141.3156	141.3156	141.3156	141.3156	141.3156	141.3156	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	138.4026	153.2315	138.4026	143.0161	138.4026	143.0161	138.4026	138.4026	143.0161	138.4026	143.0161	138.4026	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	274.3987	277.2461	270.0707	254.7953	235.5127	217.3898	205.2826	202.4352	209.6106	224.8861	244.1686	262.2915	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.1316	37.1316	37.1316	37.1316	37.1316	37.1316	37.1316	37.1316	37.1316	37.1316	37.1316	37.1316	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-113.0525	-113.0525	-113.0525	-113.0525	-113.0525	-113.0525	-113.0525	-113.0525	-113.0525	-113.0525	-113.0525	-113.0525	(71)
Water heating gains (Table 5)	181.4010	178.3621	172.3505	158.9604	150.8051	108.2864	102.9440	107.2158	112.2415	155.6963	168.5206	179.6728	(72)
Total internal gains	659.5970	674.2344	646.2186	622.1664	590.1151	534.0870	512.0240	513.4483	530.2629	584.3796	621.1000	645.7616	(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
Northeast	4.9300	11.2829	0.6300	0.7000	0.7700	16.9997 (75)
Southeast	8.9700	36.7938	0.6300	0.7000	0.7700	100.8647 (77)

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Southwest	0.8800		36.7938		0.6300		0.7000		0.7700		9.8953 (79)	
Northwest	10.8900		11.2829		0.6300		0.7000		0.7700		37.5510 (81)	

Solar gains	165.3108	299.7049	458.1982	648.4009	799.8960	826.5002	783.3557	665.3819	523.2850	344.2146	201.3039	139.3364 (83)
Total gains	824.9078	973.9393	1104.4167	1270.5673	1390.0111	1360.5872	1295.3797	1178.8303	1053.5479	928.5942	822.4039	785.0980 (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	65.0307	65.2740	65.5142	66.6665	66.8866	67.9306	67.9306	68.1276	67.5246	66.8866	66.4428	65.9851
alpha	5.3354	5.3516	5.3676	5.4444	5.4591	5.5287	5.5287	5.5418	5.5016	5.4591	5.4295	5.3990
util living area	0.9959	0.9895	0.9716	0.9033	0.7510	0.5568	0.4083	0.4659	0.7357	0.9447	0.9903	0.9968 (86)
Living	20.0542	20.2096	20.4287	20.7064	20.8763	20.9335	20.9423	20.9409	20.8999	20.6667	20.3174	20.0378
Non living	18.8791	19.0793	19.3567	19.7013	19.8810	19.9416	19.9465	19.9487	19.9143	19.6664	19.2305	18.8689
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	31	28	31	30	31	30	31	31	30	31	30	31
16 / 9	0	0	0	0	0	0	0	0	0	0	0	0
MIT	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000 (87)
Th 2	19.9797	19.9831	19.9865	20.0022	20.0052	20.0190	20.0190	20.0215	20.0137	20.0052	19.9992	19.9930 (88)
util rest of house												
	0.9945	0.9860	0.9620	0.8736	0.6912	0.4764	0.3182	0.3688	0.6529	0.9207	0.9864	0.9957 (89)
MIT 2	19.9797	19.9831	19.9865	20.0022	20.0052	20.0190	20.0190	20.0215	20.0137	20.0052	19.9992	19.9930 (90)
Living area fraction										FLA = Living area / (4) =		0.1571 (91)
MIT	20.1401	20.1429	20.1458	20.1590	20.1615	20.1731	20.1731	20.1753	20.1687	20.1615	20.1565	20.1512 (92)
Temperature adjustment												0.0000
adjusted MIT	20.1401	20.1429	20.1458	20.1590	20.1615	20.1731	20.1731	20.1753	20.1687	20.1615	20.1565	20.1512 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9947	0.9866	0.9637	0.8788	0.7012	0.4893	0.3325	0.3843	0.6669	0.9251	0.9871	0.9959 (94)
Useful gains	820.5676	960.9215	1064.3414	1116.5818	974.6425	665.7770	430.6815	453.0058	702.6240	859.0655	811.8204	781.8970 (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	1997.4438	1914.9829	1708.0424	1384.9369	1037.3992	672.7758	431.3405	454.4268	736.9987	1172.2613	1611.4424	1982.3698 (97)
Space heating kWh	875.5959	641.1292	478.9135	193.2157	46.6910	0.0000	0.0000	0.0000	0.0000	233.0177	575.7279	893.1518 (98a)
Space heating requirement - total per year (kWh/year)												3937.4426
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	875.5959	641.1292	478.9135	193.2157	46.6910	0.0000	0.0000	0.0000	0.0000	233.0177	575.7279	893.1518 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3937.4426
Space heating per m2	(98c) / (4) =											35.1557 (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 %)												370.9824 (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	875.5959	641.1292	478.9135	193.2157	46.6910	0.0000	0.0000	0.0000	0.0000	233.0177	575.7279	893.1518 (98)
Space heating efficiency (main heating system 1)	370.9824	370.9824	370.9824	370.9824	370.9824	0.0000	0.0000	0.0000	0.0000	370.9824	370.9824	370.9824 (210)
Space heating fuel (main heating system)	236.0208	172.8193	129.0933	52.0822	12.5858	0.0000	0.0000	0.0000	0.0000	62.8110	155.1901	240.7531 (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	368.1845	326.4120	347.9333	307.7145	299.7233	240.9746	237.0530	246.6114	249.5391	310.6678	328.4163	364.3175 (64)
Efficiency of water heater (217)m	120.9600	120.9600	120.9600	120.9600	120.9600	120.9600	120.9600	120.9600	120.9600	120.9600	120.9600	120.9600 (216)
Fuel for water heating, kWh/month	304.3853	269.8512	287.6432	254.3936	247.7871	199.2184	195.9764	203.8785	206.2989	256.8351	271.5081	301.1884 (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	27.1796	21.8045	19.6325	14.3836	11.1103	9.0772	10.1352	13.1741	17.1119	22.4517	25.3592	27.9350 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-58.1921	-105.9226	-201.0387	-292.6536	-374.6535	-369.9466	-361.9266	-308.1311	-226.5103	-140.8811	-70.7936	-47.4365 (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)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	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												1061.3555 (211)

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Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	120.9600	
Water heating fuel used	2998.9644	(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)	219.3549	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-2558.0863	(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	1721.5885	(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	1061.3555	0.1566	166.2016 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2998.9644	0.1416	424.5701 (264)
Space and water heating			590.7716 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	219.3549	0.1443	31.6597 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-2558.0863	0.1301	-332.7898
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-332.7898 (269)
Total CO2, kg/year			289.6416 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			2.5900 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	1061.3555	1.5797	1676.6474 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2998.9644	1.5235	4569.0083 (278)
Space and water heating			6245.6557 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	219.3549	1.5338	336.4539 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-2558.0863	1.4805	-3787.3389
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-3787.3389 (283)
Total Primary energy kWh/year			2794.7707 (286)
Dwelling Primary energy Rate (DPER)			24.9500 (287)

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

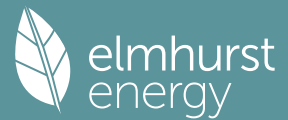
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	56.0000 (1b)	x 2.4000 (2b)	= 134.4000 (1b) - (3b)
First floor	56.0000 (1c)	x 2.6500 (2c)	= 148.4000 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)... (1n)	112.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)... (3n)	= 282.8000 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) = 40.0000 / (5) = 0.1414 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3914 (18)
Number of sides sheltered	1 (19)

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Shelter factor
Infiltration rate adjusted to include shelter factor

$$(20) = 1 - [0.075 \times (19)] = 0.9250 \quad (20)$$
$$(21) = (18) \times (20) = 0.3621 \quad (21)$$

	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	0.4617	0.4526	0.4436	0.3983	0.3892	0.3440	0.3440	0.3349	0.3621	0.3892	0.4073	0.4254	(22b)
	0.6066	0.6024	0.5984	0.5793	0.5758	0.5592	0.5592	0.5561	0.5656	0.5758	0.5830	0.5905	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			2.1100	1.0000	2.1100			(26)
TER Opening Type			25.6700	1.1450	29.3931			(27)
Heatloss Floor 1			56.0000	0.1300	7.2800			(28a)
Heatloss Floor 2			1.7500	0.1300	0.2275			(28b)
External Wall 1	111.9100	27.7800	84.1300	0.1800	15.1434			(29a)
External Roof 1	56.0000		56.0000	0.1100	6.1600			(30)
Total net area of external elements Aum(A, m2)			225.6600					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	60.3140		(33)
Main dwelling								
Party Wall 1			68.6800	0.0000	0.0000			(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							263.5851	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E12 Gable (insulation at ceiling level)	5.0600	0.0600	0.3036	
E10 Eaves (insulation at ceiling level)	18.6000	0.0600	1.1160	
E21 Exposed floor (inverted)	3.0000	0.3200	0.9600	
P1 Party wall - Ground floor	12.4000	0.0800	0.9920	
P2 Party wall - Intermediate floor within a dwelling	12.4000	0.0000	0.0000	
P4 Party wall - Roof (insulation at ceiling level)	12.4000	0.1200	1.4880	
E16 Corner (normal)	17.3000	0.0900	1.5570	
E17 Corner (inverted - internal area greater than external area)	7.2000	-0.0900	-0.6480	
E2 Other lintels (including other steel lintels)	19.6600	0.0500	0.9830	
E3 Sill	18.6600	0.0500	0.9330	
E4 Jamb	44.8000	0.0500	2.2400	
E5 Ground floor (normal)	23.0000	0.1600	3.6800	
E6 Intermediate floor within a dwelling	21.4000	0.0000	0.0000	
E18 Party wall between dwellings	10.1000	0.0600	0.6060	

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

Point Thermal Bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	74.5246	(37)

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

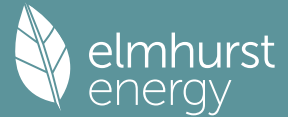
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	56.6070	56.2208	55.8423	54.0643	53.7317	52.1832	52.1832	51.8964	52.7796	53.7317	54.4046	55.1082	(38)
Heat transfer coeff	131.1316	130.7454	130.3669	128.5890	128.2563	126.7078	126.7078	126.4210	127.3043	128.2563	128.9293	129.6328	(39)
Average = Sum(39)m / 12 =												128.5874	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1708	1.1674	1.1640	1.1481	1.1451	1.1313	1.1313	1.1288	1.1366	1.1451	1.1512	1.1574	(40)
HLP (average)												1.1481	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.8263	(42)
Hot water usage for mixer showers														
71.6078	70.5317	68.9635	65.9632	63.7490	61.2798	59.8763	61.4326	63.1385	65.7897	68.8545	71.3334		(42a)	
Hot water usage for baths														
30.9169	30.4578	29.8112	28.6190	27.7263	26.7364	26.2017	26.8438	27.5429	28.6021	29.8188	30.8124		(42b)	
Hot water usage for other uses														
43.5743	41.9897	40.4052	38.8207	37.2362	35.6517	35.6517	37.2362	38.8207	40.4052	41.9897	43.5743		(42c)	
Average daily hot water use (litres/day)													134.2978	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Daily hot water use														
146.0990	142.9792	139.1799	133.4029	128.7115	123.6679	121.7297	125.5125	129.5021	134.7970	140.6631	145.7201		(44)	
Energy content (annual)	231.3851	203.6004	213.9144	182.6219	173.2704	152.0641	147.2215	155.4108	159.6891	182.9183	200.4003	228.1624	(45)	
Distribution loss (46)m = 0.15 x (45)m														
34.7078	30.5401	32.0872	27.3933	25.9906	22.8096	22.0832	23.3116	23.9534	27.4377	30.0600	34.2244		(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	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														
277.9800	245.6861	260.5093	227.7137	219.8653	197.1559	193.8164	202.0057	204.7809	229.5132	245.4922	274.7573		(62)	
WWHRS	-32.7361	-28.9521	-30.3169	-25.1036	-23.3957	-20.0198	-18.7654	-19.9551	-20.7133	-24.4187	-27.6634	-32.1299	(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														
245.2439	216.7341	230.1923	202.6101	196.4696	177.1361	175.0510	182.0505	184.0676	205.0945	217.8287	242.6275		(64)	
12Total per year (kWh/year)													2475.1059	(64)
Electric shower(s)													2475	(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														
114.2115	101.3657	108.4024	96.7952	94.8883	86.6348	86.2271	88.9500	89.1701	98.0962	102.7066	113.1399		(65)	

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

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	141.3156	141.3156	141.3156	141.3156	141.3156	141.3156	141.3156	141.3156	141.3156	141.3156	141.3156	141.3156 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	138.4026	153.2315	138.4026	143.0161	138.4026	143.0161	138.4026	138.4026	143.0161	138.4026	143.0161	138.4026 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	274.3987	277.2461	270.0707	254.7953	235.5127	217.3898	205.2826	202.4352	209.6106	224.8861	244.1686	262.2915 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.1316	37.1316	37.1316	37.1316	37.1316	37.1316	37.1316	37.1316	37.1316	37.1316	37.1316	37.1316 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-113.0525	-113.0525	-113.0525	-113.0525	-113.0525	-113.0525	-113.0525	-113.0525	-113.0525	-113.0525	-113.0525	-113.0525 (71)
Water heating gains (Table 5)	153.5100	150.8418	145.7022	134.4378	127.5381	120.3261	115.8966	119.5564	123.8473	131.8498	142.6480	152.0698 (72)
Total internal gains	634.7060	649.7141	622.5703	600.6439	569.8481	546.1267	524.9766	525.7890	541.8687	563.5332	598.2274	621.1586 (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
Northeast				4.9300	11.2829		0.6300		0.7000		0.7700		16.9997 (75)
Southeast				8.9700	36.7938		0.6300		0.7000		0.7700		100.8647 (77)
Southwest				0.8800	36.7938		0.6300		0.7000		0.7700		9.8953 (79)
Northwest				10.8900	11.2829		0.6300		0.7000		0.7700		37.5510 (81)
Solar gains	165.3108	299.7049	458.1982	648.4009	799.8960	826.5002	783.3557	665.3819	523.2850	344.2146	201.3039	139.3364	(83)
Total gains	800.0168	949.4190	1080.7685	1249.0448	1369.7441	1372.6268	1308.3323	1191.1709	1065.1537	907.7478	799.5313	760.4950	(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	62.5358	62.7205	62.9027	63.7724	63.9378	64.7192	64.7192	64.8660	64.4160	63.9378	63.6041	63.2589
alpha	5.1691	5.1814	5.1935	5.2515	5.2625	5.3146	5.3146	5.3244	5.2944	5.2625	5.2403	5.2173
util living area	0.9965	0.9911	0.9758	0.9167	0.7771	0.5755	0.4235	0.4827	0.7505	0.9537	0.9919	0.9973 (86)
MIT	19.7266	19.9350	20.2349	20.6227	20.8821	20.9807	20.9968	20.9939	20.9274	20.5700	20.0833	19.6991 (87)
Th 2	19.9434	19.9462	19.9489	19.9617	19.9641	19.9753	19.9753	19.9774	19.9710	19.9641	19.9593	19.9542 (88)
util rest of house	0.9953	0.9880	0.9673	0.8893	0.7170	0.4901	0.3263	0.3783	0.6657	0.9323	0.9885	0.9964 (89)
MIT 2	18.4708	18.7379	19.1174	19.5946	19.8724	19.9654	19.9744	19.9755	19.9258	19.5461	18.9379	18.4435 (90)
Living area fraction	18.6681	18.9260	19.2930	19.7562	20.0311	20.1250	20.1351	20.1355	20.0832	19.7070	19.1179	18.6408 (92)
MIT	18.6681	18.9260	19.2930	19.7562	20.0311	20.1250	20.1351	20.1355	20.0832	19.7070	19.1179	18.6408 (93)
Temperature adjustment	18.6681	18.9260	19.2930	19.7562	20.0311	20.1250	20.1351	20.1355	20.0832	19.7070	19.1179	18.6408 (93)
adjusted MIT	18.6681	18.9260	19.2930	19.7562	20.0311	20.1250	20.1351	20.1355	20.0832	19.7070	19.1179	18.6408 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9931	0.9838	0.9603	0.8829	0.7212	0.5029	0.3416	0.3947	0.6758	0.9255	0.9846	0.9946 (94)
Useful gains	794.4918	934.0420	1037.8762	1102.7343	987.8998	690.3420	446.9350	470.1765	719.8561	840.1289	787.2579	756.3716 (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	1884.1174	1833.8373	1667.7800	1395.9836	1068.5155	700.0572	447.9251	472.2503	761.6881	1168.0294	1549.4546	1872.0069 (97)
Space heating kWh	810.6814	604.6624	468.6484	211.1395	59.9781	0.0000	0.0000	0.0000	0.0000	243.9580	548.7816	830.0327 (98a)
Space heating requirement - total per year (kWh/year)												3777.8822
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	810.6814	604.6624	468.6484	211.1395	59.9781	0.0000	0.0000	0.0000	0.0000	243.9580	548.7816	830.0327 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3777.8822
Space heating per m ²										(98c) / (4) =		33.7311 (99)

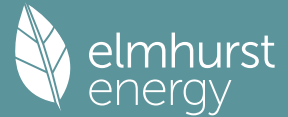
9a. Energy requirements - Individual heating systems, including micro-CHP

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	810.6814	604.6624	468.6484	211.1395	59.9781	0.0000	0.0000	0.0000	0.0000	243.9580	548.7816	830.0327 (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)	878.3114	655.1056	507.7448	228.7535	64.9817	0.0000	0.0000	0.0000	0.0000	264.3098	594.5629	899.2771 (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)

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

	Area (m ²)		Storey height (m)		Volume (m ³)
Main dwelling					
Ground floor	56.0000 (1b)	x	2.4000 (2b)	=	134.4000 (1b) - (3b)
First floor	56.0000 (1c)	x	2.6500 (2c)	=	148.4000 (1c) - (3c)

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Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)
Dwelling volume

112.0000

(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 282.8000 (4)
(5)

2. Ventilation rate

												m3 per hour
Number of open chimneys												0 * 80 = 0.0000 (6a)
Number of open flues												0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire												0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler												0 * 20 = 0.0000 (6d)
Number of flues attached to other heater												0 * 35 = 0.0000 (6e)
Number of blocked chimneys												0 * 20 = 0.0000 (6f)
Number of intermittent extract fans												4 * 10 = 40.0000 (7a)
Number of passive vents												0 * 10 = 0.0000 (7b)
Number of flueless gas fires												0 * 40 = 0.0000 (7c)
												Air changes per hour
Infiltration due to chimneys, flues and fans												40.0000 / (5) = 0.1414 (8)
Pressure test												Yes
Pressure Test Method												Blower Door
Measured/design AP50												5.1000 (17)
Infiltration rate												0.3964 (18)
Number of sides sheltered												1 (19)
												Shelter factor
Shelter factor												(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor												(21) = (18) x (20) = 0.3667 (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													
	0.4676	0.4584	0.4492	0.4034	0.3942	0.3484	0.3484	0.3392	0.3667	0.3942	0.4125	0.4309	(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	0.6093	0.6051	0.6009	0.5814	0.5777	0.5607	0.5607	0.5575	0.5672	0.5777	0.5851	0.5928	(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								
windows			25.6700	1.1450	29.3931			(27)
doors			2.1100	1.4000	2.9540			(26)
Heatloss Floor 1			56.0000	0.1000	5.6000	75.0000	4200.0000	(28a)
Heatloss Floor 2			1.7500	0.1800	0.3150	20.0000	35.0000	(28b)
External Wall 1	111.9100	27.7800	84.1300	0.1800	15.1434	140.0000	11778.2000	(29a)
External Roof 1	56.0000		56.0000	0.1200	6.7200	9.0000	504.0000	(30)
Total net area of external elements Aum(A, m2)			225.6600					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 60.1255			(33)
Main dwelling								
Party Wall 1			68.6800	0.0000	0.0000	140.0000	9615.2000	(32)
Internal Wall 1			208.5700			9.0000	1877.1300	(32c)
Internal Floor 1			56.0000			18.0000	1008.0000	(32d)
Internal Ceiling 1			56.0000			9.0000	504.0000	(32e)

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K
(28)...(30) + (32) + (32a)...(32e) = 29521.5300 (34)
263.5851 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E12 Gable (insulation at ceiling level)	5.0600	0.0430	0.2176
E10 Eaves (insulation at ceiling level)	18.6000	0.0570	1.0602
E21 Exposed floor (inverted)	3.0000	0.3200	0.9600
P1 Party wall - Ground floor	12.4000	0.0500	0.6200
P2 Party wall - Intermediate floor within a dwelling	12.4000	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	12.4000	0.0420	0.4960
E16 Corner (normal)	17.3000	0.0420	0.7266
E17 Corner (inverted - internal area greater than external area)	7.2000	-0.0850	-0.6120
E2 Other lintels (including other steel lintels)	19.6600	0.0250	0.4915
E3 Sill	18.6600	0.0220	0.4105
E4 Jamb	44.8000	0.0170	0.7616
E5 Ground floor (normal)	23.0000	0.0750	1.7250
E6 Intermediate floor within a dwelling	21.4000	0.0010	0.0214
E18 Party wall between dwellings	10.1000	0.0330	0.3333

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

Point Thermal bridges
Total fabric heat loss
(33) + (36) + (36a) = 67.3372 (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	
	56.8627	56.4666	56.0783	54.2546	53.9134	52.3251	52.3251	52.0310	52.9369	53.9134	54.6037	55.3253	(38)
Heat transfer coeff	124.1999	123.8038	123.4155	121.5919	121.2507	119.6623	119.6623	119.3682	120.2741	121.2507	121.9409	122.6625	(39)
Average = Sum(39)m / 12 =												121.5902	

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.1089	1.1054	1.1019	1.0856	1.0826	1.0684	1.0684	1.0658	1.0739	1.0826	1.0888	1.0952	(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													2.8263 (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													
30.9169	30.4578	29.8112	28.6190	27.7263	26.7364	26.2017	26.8438	27.5429	28.6021	29.8188	30.8124		(42b)
Hot water usage for other uses													
43.5743	41.9897	40.4052	38.8207	37.2362	35.6517	35.6517	37.2362	38.8207	40.4052	41.9897	43.5743		(42c)
Average daily hot water use (litres/day)													68.2778 (43)

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	74.4912	72.4475	70.2164	67.4397	64.9624	62.3881	61.8534	64.0800	66.3636	69.0073	71.8086	74.3867	(44)
Energy conte	117.9758	103.1643	107.9200	92.3215	87.4519	76.7134	74.8063	79.3444	81.8329	93.6423	102.3045	116.4715	(45)
Energy content (annual)	Total = Sum(45)m = 1133.9488												
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):	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)
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	(57)
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	(59)
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	(61)
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	(62)
Total heat required for water heating calculated for each month	100.2794	87.6896	91.7320	78.4733	74.3341	65.2064	63.5854	67.4427	69.5580	79.5959	86.9588	99.0008	(63a)
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	(63b)
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	(63c)
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	(63d)
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	(64)
Output from w/h	100.2794	87.6896	91.7320	78.4733	74.3341	65.2064	63.5854	67.4427	69.5580	79.5959	86.9588	99.0008	(64)
12Total per year (kWh/year)	Total per year (kWh/year) = Sum(64)m = 963.8565												(64)
Electric shower(s)	57.3459	51.0957	55.7945	53.2440	54.2431	51.7427	53.4674	54.2431	53.2440	55.7945	54.7454	57.3459	(64a)
	Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 652.3063												(64a)
Heat gains from water heating, kWh/month	39.4063	34.6963	36.8816	32.9293	32.1443	29.2373	29.2632	30.4215	30.7005	33.8476	35.4260	39.0867	(65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	141.3156	141.3156	141.3156	141.3156	141.3156	141.3156	141.3156	141.3156	141.3156	141.3156	141.3156	141.3156	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	138.4026	153.2315	138.4026	143.0161	138.4026	143.0161	138.4026	138.4026	143.0161	138.4026	143.0161	138.4026	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	274.3987	277.2461	270.0707	254.7953	235.5127	217.3898	205.2826	202.4352	209.6106	224.8861	244.1686	262.2915	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.1316	37.1316	37.1316	37.1316	37.1316	37.1316	37.1316	37.1316	37.1316	37.1316	37.1316	37.1316	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-113.0525	-113.0525	-113.0525	-113.0525	-113.0525	-113.0525	-113.0525	-113.0525	-113.0525	-113.0525	-113.0525	-113.0525	(71)
Water heating gains (Table 5)	52.9655	51.6314	49.5721	45.7352	43.2047	40.6073	39.3323	40.8891	42.6396	45.4941	49.2028	52.5359	(72)
Total internal gains	531.1615	547.5037	523.4402	508.9412	482.5148	466.4079	448.4122	447.1216	460.6609	474.1775	501.7822	518.6247	(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
Northeast				4.9300	11.2829		0.6300		0.7000		0.7700		16.9997 (75)
Southeast				8.9700	36.7938		0.6300		0.7000		0.7700		100.8647 (77)
Southwest				0.8800	36.7938		0.6300		0.7000		0.7700		9.8953 (79)
Northwest				10.8900	11.2829		0.6300		0.7000		0.7700		37.5510 (81)
Solar gains	165.3108	299.7049	458.1982	648.4009	799.8960	826.5002	783.3557	665.3819	523.2850	344.2146	201.3039	139.3364	(83)
Total gains	696.4723	847.2086	981.6383	1157.3421	1282.4107	1292.9081	1231.7679	1112.5036	983.9459	818.3921	703.0861	657.9611	(84)

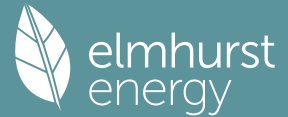
7. Mean internal temperature (heating season)

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	66.0260	66.2373	66.4457	67.4422	67.6320	68.5297	68.5297	68.6986	68.1811	67.6320	67.2492	66.8535
alpha	5.4017	5.4158	5.4297	5.4961	5.5088	5.5686	5.5686	5.5799	5.5454	5.5088	5.4833	5.4569
util living area	0.9982	0.9944	0.9823	0.9278	0.7872	0.5788	0.4253	0.4887	0.7670	0.9655	0.9953	0.9987 (86)
MIT	19.7254	19.9356	20.2363	20.6310	20.8903	20.9837	20.9975	20.9949	20.9300	20.5628	20.0768	19.6994 (87)
Th 2	19.9935	19.9964	19.9993	20.0126	20.0151	20.0267	20.0267	20.0289	20.0222	20.0151	20.0100	20.0048 (88)
util rest of house	0.9975	0.9924	0.9760	0.9034	0.7297	0.4968	0.3324	0.3881	0.6860	0.9489	0.9933	0.9982 (89)
MIT 2	18.8341	19.0454	19.3441	19.7289	19.9478	20.0201	20.0262	20.0276	19.9876	19.6761	19.1975	18.8170 (90)
Living area fraction	18.9742	19.1853	19.4843	19.8707	20.0959	20.1716	20.1788	20.1796	fLA = Living area / (4) =			0.1571 (91)
MIT	18.9742	19.1853	19.4843	19.8707	20.0959	20.1716	20.1788	20.1796	20.1357	19.8154	19.3357	18.9557 (92)
Temperature adjustment												0.0000
adjusted MIT	18.9742	19.1853	19.4843	19.8707	20.0959	20.1716	20.1788	20.1796	20.1357	19.8154	19.3357	18.9557 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9966	0.9902	0.9717	0.8993	0.7348	0.5093	0.3470	0.4040	0.6963	0.9446	0.9914	0.9975	(94)
Useful gains	694.0844	838.9368	953.8733	1040.8264	942.3465	658.5217	427.4684	449.4164	685.1056	773.0223	697.0352	656.2843	(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	1822.5278	1768.5783	1602.4585	1333.9472	1018.0114	666.7062	428.2473	451.1641	725.9338	1117.3776	1492.0345	1809.9684	(97)
Space heating kWh	839.5619	624.7191	482.5474	211.0470	56.2947	0.0000	0.0000	0.0000	0.0000	256.2003	572.3995	858.3410	(98a)
Space heating requirement - total per year (kWh/year)	3901.1108												
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)

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Solar heating contribution - total per year (kWh/year)													0.0000
Space heating kWh	839.5619	624.7191	482.5474	211.0470	56.2947	0.0000	0.0000	0.0000	0.0000	256.2003	572.3995	858.3410	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3901.1108	
Space heating per m2											(98c) / (4) =	34.8313	(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													
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	1124.8260	885.5013	907.1983	0.0000	0.0000	0.0000	0.0000	(100)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.9336	0.9685	0.9477	0.0000	0.0000	0.0000	0.0000	(101)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1050.0860	857.6282	859.7202	0.0000	0.0000	0.0000	0.0000	(102)
Space cooling kWh													
Cooled fraction	0.0000	0.0000	0.0000	0.0000	0.0000	291.1990	392.9079	289.6756	0.0000	0.0000	0.0000	0.0000	(104)
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	(105)
Space cooling kWh													
Space cooling requirement	0.0000	0.0000	0.0000	0.0000	0.0000	72.7997	98.2270	72.4189	0.0000	0.0000	0.0000	0.0000	(107)
Energy for space heating												243.4456	(107)
Energy for space cooling												34.8313	(99)
Total												2.1736	(108)
Fabric Energy Efficiency (DFEE)												37.0050	(109)
												37.0	(109)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)	
Main dwelling				
Ground floor	56.0000 (1b)	x 2.4000 (2b)	= 134.4000 (1b) - (3b)	
First floor	56.0000 (1c)	x 2.6500 (2c)	= 148.4000 (1c) - (3c)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	112.0000		(4)	
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	282.8000 (5)	

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	4 * 10 =	40.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) = 0.1414 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3914 (18)
Number of sides sheltered		1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3621 (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	0.4617	0.4526	0.4436	0.3983	0.3892	0.3440	0.3440	0.3349	0.3621	0.3892	0.4073	0.4254	(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	0.6066	0.6024	0.5984	0.5793	0.5758	0.5592	0.5592	0.5561	0.5656	0.5758	0.5830	0.5905	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			2.1100	1.0000	2.1100			(26)
TER Opening Type			25.6700	1.1450	29.3931			(27)
Heatloss Floor 1			56.0000	0.1300	7.2800			(28a)
Heatloss Floor 2			1.7500	0.1300	0.2275			(28b)
External Wall 1	111.9100	27.7800	84.1300	0.1800	15.1434			(29a)
External Roof 1	56.0000		56.0000	0.1100	6.1600			(30)
Total net area of external elements Aum(A, m2)			225.6600					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	60.3140		(33)
Main dwelling								

Full SAP Calculation Printout



Party Wall 1	68.6800	0.0000	0.0000	(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K				263.5851 (35)
List of Thermal Bridges				
K1 Element	Length	Psi-value	Total	
E12 Gable (insulation at ceiling level)	5.0600	0.0600	0.3036	
E10 Eaves (insulation at ceiling level)	18.6000	0.0600	1.1160	
E21 Exposed floor (inverted)	3.0000	0.3200	0.9600	
P1 Party wall - Ground floor	12.4000	0.0800	0.9920	
P2 Party wall - Intermediate floor within a dwelling	12.4000	0.0000	0.0000	
P4 Party wall - Roof (insulation at ceiling level)	12.4000	0.1200	1.4880	
E16 Corner (normal)	17.3000	0.0900	1.5570	
E17 Corner (inverted - internal area greater than external area)	7.2000	-0.0900	-0.6480	
E2 Other lintels (including other steel lintels)	19.6600	0.0500	0.9830	
E3 Sill	18.6600	0.0500	0.9330	
E4 Jamb	44.8000	0.0500	2.2400	
E5 Ground floor (normal)	23.0000	0.1600	3.6800	
E6 Intermediate floor within a dwelling	21.4000	0.0000	0.0000	
E18 Party wall between dwellings	10.1000	0.0600	0.6060	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			14.2106	(36)
Point Thermal bridges			0.0000	(36a)
Total fabric heat loss		(33) + (36) + (36a) =	74.5246	(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)
Heat transfer coeff	56.6070	56.2208	55.8423	54.0643	53.7317	52.1832	52.1832	51.8964	52.7796	53.7317	54.4046	55.1082	(39)
Average = Sum(39)m / 12 =	131.1316	130.7454	130.3669	128.5890	128.2563	126.7078	126.7078	126.4210	127.3043	128.2563	128.9293	129.6328	(39)
												128.5874	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(40)
HLP (average)	1.1708	1.1674	1.1640	1.1481	1.1451	1.1313	1.1313	1.1288	1.1366	1.1451	1.1512	1.1574	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

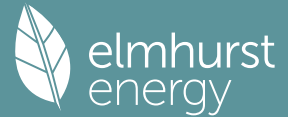
4. Water heating energy requirements (kWh/year)												
Assumed occupancy												2.8263 (42)
Hot water usage for mixer showers												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42a)
Hot water usage for baths	30.9169	30.4578	29.8112	28.6190	27.7263	26.7364	26.2017	26.8438	27.5429	28.6021	29.8188	30.8124 (42b)
Hot water usage for other uses	43.5743	41.9897	40.4052	38.8207	37.2362	35.6517	35.6517	37.2362	38.8207	40.4052	41.9897	43.5743 (42c)
Average daily hot water use (litres/day)												68.2778 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	74.4912	72.4475	70.2164	67.4397	64.9624	62.3881	61.8534	64.0800	66.3636	69.0073	71.8086	74.3867 (44)
Energy content (annual)	117.9758	103.1643	107.9200	92.3215	87.4519	76.7134	74.8063	79.3444	81.8329	93.6423	102.3045	116.4715 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		1133.9488
	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												
	100.2794	87.6896	91.7320	78.4733	74.3341	65.2064	63.5854	67.4427	69.5580	79.5959	86.9588	99.0008 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	100.2794	87.6896	91.7320	78.4733	74.3341	65.2064	63.5854	67.4427	69.5580	79.5959	86.9588	99.0008 (64)
12Total per year (kWh/year)									Total per year (kWh/year) = Sum(64)m =			963.8565 (64)
Electric shower(s)	57.3459	51.0957	55.7945	53.2440	54.2431	51.7427	53.4674	54.2431	53.2440	55.7945	54.7454	57.3459 (64a)
												652.3063 (64a)
Heat gains from water heating, kWh/month	39.4063	34.6963	36.8816	32.9293	32.1443	29.2373	29.2632	30.4215	30.7005	33.8476	35.4260	39.0867 (65)

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

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	141.3156	141.3156	141.3156	141.3156	141.3156	141.3156	141.3156	141.3156	141.3156	141.3156	141.3156	141.3156 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	138.4026	153.2315	138.4026	143.0161	138.4026	143.0161	138.4026	138.4026	143.0161	138.4026	143.0161	138.4026 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	274.3987	277.2461	270.0707	254.7953	235.5127	217.3898	205.2826	202.4352	209.6106	224.8861	244.1686	262.2915 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.1316	37.1316	37.1316	37.1316	37.1316	37.1316	37.1316	37.1316	37.1316	37.1316	37.1316	37.1316 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-113.0525	-113.0525	-113.0525	-113.0525	-113.0525	-113.0525	-113.0525	-113.0525	-113.0525	-113.0525	-113.0525	-113.0525 (71)
Water heating gains (Table 5)	52.9655	51.6314	49.5721	45.7352	43.2047	40.6073	39.3323	40.8891	42.6396	45.4941	49.2028	52.5359 (72)
Total internal gains	531.1615	547.5037	523.4402	508.9412	482.5148	466.4079	448.4122	447.1216	460.6609	474.1775	501.7822	518.6247 (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							

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Northeast			4.9300		11.2829		0.6300		0.7000		0.7700		16.9997 (75)
Southeast			8.9700		36.7938		0.6300		0.7000		0.7700		100.8647 (77)
Southwest			0.8800		36.7938		0.6300		0.7000		0.7700		9.8953 (79)
Northwest			10.8900		11.2829		0.6300		0.7000		0.7700		37.5510 (81)

Solar gains	165.3108	299.7049	458.1982	648.4009	799.8960	826.5002	783.3557	665.3819	523.2850	344.2146	201.3039	139.3364	(83)
Total gains	696.4723	847.2086	981.6383	1157.3421	1282.4107	1292.9081	1231.7679	1112.5036	983.9459	818.3921	703.0861	657.9611	(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	62.5358	62.7205	62.9027	63.7724	63.9378	64.7192	64.7192	64.8660	64.4160	63.9378	63.6041	63.2589	
alpha	5.1691	5.1814	5.1935	5.2515	5.2625	5.3146	5.3146	5.3244	5.2944	5.2625	5.2403	5.2173	
util living area	0.9982	0.9946	0.9837	0.9358	0.8084	0.6065	0.4489	0.5147	0.7898	0.9690	0.9955	0.9986	(86)
MIT	19.6333	19.8451	20.1535	20.5658	20.8566	20.9754	20.9958	20.9918	20.9069	20.5032	19.9979	19.6062	(87)
Th 2	19.9434	19.9462	19.9489	19.9617	19.9641	19.9753	19.9753	19.9774	19.9710	19.9641	19.9593	19.9542	(88)
util rest of house	0.9975	0.9927	0.9777	0.9129	0.7510	0.5184	0.3464	0.4045	0.7078	0.9535	0.9935	0.9982	(89)
MIT 2	18.7030	18.9158	19.2225	19.6259	19.8752	19.9653	19.9744	19.9754	19.9242	19.5777	19.0790	18.6844	(90)
Living area fraction	FLA = Living area / (4) =												
MIT	18.8492	19.0619	19.3688	19.7736	20.0294	20.1240	20.1349	20.1351	20.0786	19.7232	19.2234	18.8292	(92)
Temperature adjustment	0.0000												
adjusted MIT	18.8492	19.0619	19.3688	19.7736	20.0294	20.1240	20.1349	20.1351	20.0786	19.7232	19.2234	18.8292	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9965	0.9905	0.9734	0.9079	0.7550	0.5316	0.3626	0.4219	0.7174	0.9487	0.9916	0.9974	(94)
Useful gains	694.0495	839.1465	955.5128	1050.8007	968.2158	687.3720	446.5807	469.3452	705.8744	776.4363	697.1666	656.2424	(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	1907.8560	1851.5974	1677.6658	1398.2227	1068.3019	699.9395	447.9010	472.1929	761.1012	1170.1041	1563.0632	1896.4286	(97)
Space heating kWh	903.0720	680.3670	537.2818	250.1439	74.4641	0.0000	0.0000	0.0000	0.0000	292.8889	623.4456	922.6985	(98a)
Space heating requirement - total per year (kWh/year)	4284.3617												
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	903.0720	680.3670	537.2818	250.1439	74.4641	0.0000	0.0000	0.0000	0.0000	292.8889	623.4456	922.6985	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)	4284.3617												
Space heating per m2	(98c) / (4) = 38.2532 (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												
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	1191.0532	937.6377	960.7998	0.0000	0.0000	0.0000	0.0000 (100)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.9126	0.9557	0.9295	0.0000	0.0000	0.0000	0.0000 (101)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1087.0056	896.0799	893.0736	0.0000	0.0000	0.0000	0.0000 (102)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	1454.5291	1385.7302	1249.0691	0.0000	0.0000	0.0000	0.0000 (103)
Cooled fraction	0.0000	0.0000	0.0000	0.0000	0.0000	264.6169	364.2998	264.8606	0.0000	0.0000	0.0000	0.0000 (104)
Intermittency factor (Table 10b)	fc = cooled area / (4) =											1.0000 (105)
Space cooling kWh	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 requirement	0.0000	0.0000	0.0000	0.0000	0.0000	66.1542	91.0750	66.2152	0.0000	0.0000	0.0000	0.0000 (107)
Energy for space heating												223.4443 (107)
Energy for space cooling												38.2532 (99)
Total												1.9950 (108)
Fabric Energy Efficiency (TFEE)												40.2483 (109)
												40.2 (109)

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

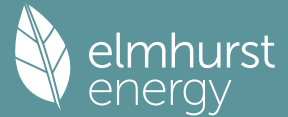
1. Overall dwelling characteristics

Main dwelling	Area (m2)	Storey height (m)	Volume (m3)	
Ground floor	56.0000 (1b)	x 2.4000 (2b)	= 134.4000 (1b) - (3b)	
First floor	56.0000 (1c)	x 2.6500 (2c)	= 148.4000 (1c) - (3c)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	112.0000		(4)	
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	282.8000 (5)	

2. Ventilation rate

m3 per hour

Full SAP Calculation Printout



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 5 * 10 = 50.0000 (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) = 50.0000 / (5) = 0.1768 (8)
Pressure test Yes
Pressure Test Method Blower Door
Measured/design AP50 5.1000 (17)
Infiltration rate 0.4318 (18)
Number of sides sheltered 1 (19)
Shelter factor (20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.3994 (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	0.5093	0.4993	0.4893	0.4394	0.4294	0.3794	0.3794	0.3695	0.3994	0.4294	0.4493	0.4693 (22b)
	0.6297	0.6246	0.6197	0.5965	0.5922	0.5720	0.5720	0.5683	0.5798	0.5922	0.6010	0.6101 (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							
windows			25.6700	1.1450	29.3931		(27)
doors			2.1100	1.4000	2.9540		(26)
Heatloss Floor 1			56.0000	0.1000	5.6000	75.0000	4200.0000 (28a)
Heatloss Floor 2			1.7500	0.1800	0.3150	20.0000	35.0000 (28b)
External Wall 1	111.9100	27.7800	84.1300	0.1800	15.1434	140.0000	11778.2000 (29a)
External Roof 1	56.0000		56.0000	0.1200	6.7200	9.0000	504.0000 (30)
Total net area of external elements Aum(A, m2)			225.6600				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 60.1255		(33)
Main dwelling							
Party Wall 1			68.6800	0.0000	0.0000	140.0000	9615.2000 (32)
Internal Wall 1			208.5700			9.0000	1877.1300 (32c)
Internal Floor 1			56.0000			18.0000	1008.0000 (32d)
Internal Ceiling 1			56.0000			9.0000	504.0000 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 29521.5300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 263.5851 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E12 Gable (insulation at ceiling level)	5.0600	0.0430	0.2176
E10 Eaves (insulation at ceiling level)	18.6000	0.0570	1.0602
E21 Exposed floor (inverted)	3.0000	0.3200	0.9600
P1 Party wall - Ground floor	12.4000	0.0500	0.6200
P2 Party wall - Intermediate floor within a dwelling	12.4000	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	12.4000	0.0400	0.4960
E16 Corner (normal)	17.3000	0.0420	0.7266
E17 Corner (inverted - internal area greater than external area)	7.2000	-0.0850	-0.6120
E2 Other lintels (including other steel lintels)	19.6600	0.0250	0.4915
E3 Sill	18.6600	0.0220	0.4105
E4 Jamb	44.8000	0.0170	0.7616
E5 Ground floor (normal)	23.0000	0.0750	1.7250
E6 Intermediate floor within a dwelling	21.4000	0.0010	0.0214
E18 Party wall between dwellings	10.1000	0.0330	0.3333

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.2117 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 67.3372 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	58.7635	58.2936	57.8330	55.6695	55.2647	53.3804	53.3804	53.0315	54.1062	55.2647	56.0836	56.9397 (38)
Heat transfer coeff	126.1007	125.6308	125.1702	123.0067	122.6020	120.7176	120.7176	120.3687	121.4434	122.6020	123.4208	124.2769 (39)
Average = Sum(39)m / 12 =												123.0048

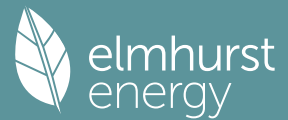
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1259	1.1217	1.1176	1.0983	1.0947	1.0778	1.0778	1.0747	1.0843	1.0947	1.1020	1.1096 (40)
HLP (average)												1.0983
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.8263 (42)
Hot water usage for mixer showers 98.4607 96.9810 94.8249 90.6994 87.6549 84.2598 82.3299 84.4698 86.8155 90.4609 94.6749 98.0835 (42a)
Hot water usage for baths 30.9169 30.4578 29.8112 28.6190 27.7263 26.7364 26.2017 26.8438 27.5429 28.6021 29.8188 30.8124 (42b)
Hot water usage for other uses 43.5743 41.9897 40.4052 38.8207 37.2362 35.6517 35.6517 37.2362 38.8207 40.4052 41.9897 43.5743 (42c)
Average daily hot water use (litres/day) 159.0553 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	172.9519	169.4285	165.0412	158.1391	152.6174	146.6478	144.1833	148.5498	153.1791	159.4682	166.4835	172.4701 (44)
Energy conte	273.9135	241.2640	253.6623	216.4845	205.4523	180.3206	174.3772	183.9356	188.8851	216.3968	237.1863	270.0465 (45)
Energy content (annual)										Total = Sum(45)m =		2641.9247
Distribution loss (46)m = 0.15 x (45)m												
41.0870 36.1896 38.0493 32.4727 30.8178 27.0481 26.1566 27.5903 28.3328 32.4595 35.5779 40.5070 (46)												
Water storage loss (or HIU loss):												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6300 (48)
Temperature factor from Table 2b												0.7800 (49)

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Enter (49) or (54) in (55)												1.2714 (55)
Total storage loss	39.4134	35.5992	39.4134	38.1420	39.4134	38.1420	39.4134	39.4134	38.1420	39.4134	38.1420	39.4134 (56)
If cylinder contains dedicated solar storage	39.4134	35.5992	39.4134	38.1420	39.4134	38.1420	39.4134	39.4134	38.1420	39.4134	38.1420	39.4134 (57)
Primary loss	54.8576	49.5488	54.8576	53.0880	54.8576	22.5120	23.2624	23.2624	22.5120	54.8576	53.0880	54.8576 (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	368.1845	326.4120	347.9333	307.7145	299.7233	240.9746	237.0530	246.6114	249.5391	310.6678	328.4163	364.3175 (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	368.1845	326.4120	347.9333	307.7145	299.7233	240.9746	237.0530	246.6114	249.5391	310.6678	328.4163	364.3175 (64)
	Total per year (kWh/year) = Sum(64)m =											3627.5473 (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	134.9623	119.8593	128.2288	114.4515	112.1990	77.9662	76.5903	79.7685	80.8139	115.8380	121.3348	133.6766 (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	169.5788	169.5788	169.5788	169.5788	169.5788	169.5788	169.5788	169.5788	169.5788	169.5788	169.5788	169.5788 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	31.0520	27.5801	22.4296	16.9807	12.6932	10.7162	11.5792	15.0511	20.2015	25.6505	29.9379	31.9150 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	409.5503	413.8002	403.0907	380.2914	351.5115	324.4624	306.3920	302.1421	312.8516	335.6509	364.4308	391.4799 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	54.7842	54.7842	54.7842	54.7842	54.7842	54.7842	54.7842	54.7842	54.7842	54.7842	54.7842	54.7842 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-113.0525	-113.0525	-113.0525	-113.0525	-113.0525	-113.0525	-113.0525	-113.0525	-113.0525	-113.0525	-113.0525	-113.0525 (71)
Water heating gains (Table 5)	181.4010	178.3621	172.3505	158.9604	150.8051	108.2864	102.9440	107.2158	112.2415	155.6963	168.5206	179.6728 (72)
Total internal gains	733.3137	731.0527	709.1812	667.5430	626.3203	554.7754	532.2257	535.7194	556.6051	628.3080	674.1997	714.3781 (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	
Northeast					4.9300	11.2829	0.6300	0.7000			0.7700	16.9997 (75)	
Southeast					8.9700	36.7938	0.6300	0.7000			0.7700	100.8647 (77)	
Southwest					0.8800	36.7938	0.6300	0.7000			0.7700	9.8953 (79)	
Northwest					10.8900	11.2829	0.6300	0.7000			0.7700	37.5510 (81)	
Solar gains	165.3108	299.7049	458.1982	648.4009	799.8960	826.5002	783.3557	665.3819	523.2850	344.2146	201.3039	139.3364	(83)
Total gains	898.6244	1030.7577	1167.3794	1315.9439	1426.2162	1381.2756	1315.5814	1201.1014	1079.8901	972.5226	875.5037	853.7145	(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	65.0307	65.2740	65.5142	66.6665	66.8866	67.9306	67.9306	68.1276	67.5246	66.8866	66.4428	65.9851
alpha	5.3354	5.3516	5.3676	5.4444	5.4591	5.5287	5.5287	5.5418	5.5016	5.4591	5.4295	5.3990
util living area												
	0.9939	0.9865	0.9645	0.8918	0.7377	0.5492	0.4021	0.4576	0.7227	0.9345	0.9871	0.9953 (86)
Living	20.1037	20.2464	20.4653	20.7244	20.8819	20.9341	20.9424	20.9412	20.9035	20.6887	20.3520	20.0843
Non living	18.9420	19.1254	19.4010	19.7207	19.8857	19.9420	19.9466	19.9488	19.9168	19.6909	19.2738	18.9281
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	31	28	31	30	31	30	31	31	30	31	30	31
16 / 9	0	0	0	0	0	0	0	0	0	0	0	0
MIT	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000 (87)
Th 2	19.9797	19.9831	19.9865	20.0022	20.0052	20.0190	20.0190	20.0215	20.0137	20.0052	19.9992	19.9930 (88)
util rest of house												
	0.9918	0.9821	0.9529	0.8600	0.6773	0.4696	0.3134	0.3621	0.6396	0.9074	0.9821	0.9937 (89)
MIT 2	19.9797	19.9831	19.9865	20.0022	20.0052	20.0190	20.0190	20.0215	20.0137	20.0052	19.9992	19.9930 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	20.1401	20.1429	20.1458	20.1590	20.1615	20.1731	20.1731	20.1753	20.1687	20.1615	20.1565	20.1512 (91)
Temperature adjustment	0.0000											
adjusted MIT	20.1401	20.1429	20.1458	20.1590	20.1615	20.1731	20.1731	20.1753	20.1687	20.1615	20.1565	20.1512 (92)
	0.0000											
	20.1512 (93)											

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9922	0.9829	0.9550	0.8656	0.6874	0.4823	0.3274	0.3773	0.6536	0.9123	0.9830	0.9939 (94)
Useful gains	891.6104	1013.1173	1114.8086	1139.0445	980.3422	666.2492	430.7309	453.1312	705.7895	887.2334	860.6451	848.5464 (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	1997.4438	1914.9829	1708.0424	1384.9369	1037.3992	672.7758	431.3405	454.4268	736.9987	1172.2613	1611.4424	1982.3698 (97)
Space heating kWh	822.7400	606.0537	441.3659	177.0425	42.4504	0.0000	0.0000	0.0000	0.0000	212.0608	540.5741	843.5646 (98a)
Space heating requirement - total per year (kWh/year)	3685.8521											
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	822.7400	606.0537	441.3659	177.0425	42.4504	0.0000	0.0000	0.0000	0.0000	212.0608	540.5741	843.5646 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	3685.8521											

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Space heating per m2

(98c) / (4) = 32.9094 (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 %)												370.9824 (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	822.7400	606.0537	441.3659	177.0425	42.4504	0.0000	0.0000	0.0000	0.0000	212.0608	540.5741	843.5646 (98)
Space heating efficiency (main heating system 1)	370.9824	370.9824	370.9824	370.9824	370.9824	0.0000	0.0000	0.0000	0.0000	370.9824	370.9824	370.9824 (210)
Space heating fuel (main heating system)	221.7733	163.3645	118.9722	47.7226	11.4427	0.0000	0.0000	0.0000	0.0000	57.1620	145.7142	227.3867 (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	368.1845	326.4120	347.9333	307.7145	299.7233	240.9746	237.0530	246.6114	249.5391	310.6678	328.4163	364.3175 (64)
Efficiency of water heater	120.9600	120.9600	120.9600	120.9600	120.9600	120.9600	120.9600	120.9600	120.9600	120.9600	120.9600	120.9600 (216)
Fuel for water heating, kWh/month	304.3853	269.8512	287.6432	254.3936	247.7871	199.2184	195.9764	203.8785	206.2989	256.8351	271.5081	301.1884 (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	27.1796	21.8045	19.6325	14.3836	11.1103	9.0772	10.1352	13.1741	17.1119	22.4517	25.3592	27.9350 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-58.1900	-105.9131	-200.9868	-292.5548	-374.5890	-369.9466	-361.9266	-308.1311	-226.5103	-140.8610	-70.7899	-47.4353 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												993.5382 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												120.9600
Water heating fuel used												2998.9644 (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)												219.3549 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-2557.8344 (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												1654.0231 (238)

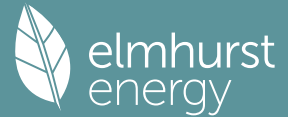
10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	993.5382	16.4900	163.8344 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2998.9644	16.4900	494.5292 (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	219.3549	16.4900	36.1716 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-2557.8344	16.4900	-421.7869
PV Unit electricity exported	0.0000	5.5900	0.0000
Total			-421.7869 (252)
Total energy cost			272.7484 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)		0.6254 (257)
SAP value	[(255) x (256)] / [(4) + 45.0] =	89.8621
SAP rating (Section 12)		90 (258)
SAP band		B

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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	993.5382	0.1567	155.6658	(261)
Total CO ₂ associated with community systems			0.0000	(373)
Water heating (other fuel)	2998.9644	0.1416	424.5701	(264)
Space and water heating			580.2359	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	219.3549	0.1443	31.6597	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-2557.8344	0.1301	-332.7538	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-332.7538	(269)
Total CO ₂ , kg/year			279.1417	(272)
CO ₂ emissions per m ²			2.4900	(273)
EI value			97.6175	
EI rating			98	(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 (m ²)	Storey height (m)	Volume (m ³)	
Main dwelling				
Ground floor	56.0000 (1b)	x 2.4000 (2b)	= 134.4000	(1b) - (3b)
First floor	56.0000 (1c)	x 2.6500 (2c)	= 148.4000	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	112.0000			(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	282.8000 (5)

2. Ventilation rate

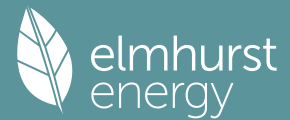
	m ³ per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	5 * 10 =	50.0000 (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) =	50.0000 / (5) =	0.1768 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.1000	(17)
Infiltration rate	0.4318	(18)
Number of sides sheltered	1	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3994 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	4.0000	3.7000	3.7000	3.3000	3.4000	3.2000	3.3000	3.5000	3.5000	3.8000	(22)
Wind factor	1.0500	1.0000	1.0000	0.9250	0.9250	0.8250	0.8500	0.8000	0.8250	0.8750	0.8750	0.9500	(22a)
Adj infilt rate	0.4194	0.3994	0.3994	0.3695	0.3695	0.3295	0.3395	0.3195	0.3295	0.3495	0.3495	0.3794	(22b)
Effective ac	0.5879	0.5798	0.5798	0.5683	0.5683	0.5543	0.5576	0.5511	0.5543	0.5611	0.5611	0.5720	(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								
windows			25.6700	1.1450	29.3931			(27)
doors			2.1100	1.4000	2.9540			(26)
Heatloss Floor 1			56.0000	0.1000	5.6000	75.0000	4200.0000	(28a)
Heatloss Floor 2			1.7500	0.1800	0.3150	20.0000	35.0000	(28b)
External Wall 1	111.9100	27.7800	84.1300	0.1800	15.1434	140.0000	11778.2000	(29a)
External Roof 1	56.0000		56.0000	0.1200	6.7200	9.0000	504.0000	(30)
Total net area of external elements Aum(A, m ²)			225.6600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	60.1255				(33)
Main dwelling								
Party Wall 1			68.6800	0.0000	0.0000	140.0000	9615.2000	(32)
Internal Wall 1			208.5700			9.0000	1877.1300	(32c)
Internal Floor 1			56.0000			18.0000	1008.0000	(32d)
Internal Ceiling 1			56.0000			9.0000	504.0000	(32e)
Heat capacity Cm = Sum (A x k)								(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							29521.5300	(34)
List of Thermal Bridges							263.5851	(35)
K1 Element					Length	Psi-value	Total	
E12 Gable (insulation at ceiling level)					5.0600	0.0430	0.2176	
E10 Eaves (insulation at ceiling level)					18.6000	0.0570	1.0602	
E21 Exposed floor (inverted)					3.0000	0.3200	0.9600	
P1 Party wall - Ground floor					12.4000	0.0500	0.6200	

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P2 Party wall - Intermediate floor within a dwelling									12.4000	0.0000	0.0000	
P4 Party wall - Roof (insulation at ceiling level)									12.4000	0.0400	0.4960	
E16 Corner (normal)									17.3000	0.0420	0.7266	
E17 Corner (inverted - internal area greater than external area)									7.2000	-0.0850	-0.6120	
E2 Other lintels (including other steel lintels)									19.6600	0.0250	0.4915	
E3 Sill									18.6600	0.0220	0.4105	
E4 Jamb									44.8000	0.0170	0.7616	
E5 Ground floor (normal)									23.0000	0.0750	1.7250	
E6 Intermediate floor within a dwelling									21.4000	0.0010	0.0214	
E18 Party wall between dwellings									10.1000	0.0330	0.3333	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)												7.2117 (36)
Point Thermal bridges												0.0000
Total fabric heat loss											(33) + (36) + (36a) =	67.3372 (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	54.8692	54.1062	54.1062	53.0315	53.0315	51.7287	52.0404	51.4263	51.7287	52.3615	52.3615	53.3804 (38)
Average = Sum(39)m / 12 =	122.2065	121.4434	121.4434	120.3687	120.3687	119.0659	119.3777	118.7635	119.0659	119.6987	119.6987	120.7176 (39)
												120.1849
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0911	1.0843	1.0843	1.0747	1.0747	1.0631	1.0659	1.0604	1.0631	1.0687	1.0687	1.0778 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31
												1.0731

4. Water heating energy requirements (kWh/year)												

Assumed occupancy												2.8263 (42)
Hot water usage for mixer showers												
	98.4607	96.9810	94.8249	90.6994	87.6549	84.2598	82.3299	84.4698	86.8155	90.4609	94.6749	98.0835 (42a)
Hot water usage for baths												
	30.9169	30.4578	29.8112	28.6190	27.7263	26.7364	26.2017	26.8438	27.5429	28.6021	29.8188	30.8124 (42b)
Hot water usage for other uses												
	43.5743	41.9897	40.4052	38.8207	37.2362	35.6517	35.6517	37.2362	38.8207	40.4052	41.9897	43.5743 (42c)
Average daily hot water use (litres/day)												159.0553 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	172.9519	169.4285	165.0412	158.1391	152.6174	146.6478	144.1833	148.5498	153.1791	159.4682	166.4835	172.4701 (44)
Energy content (annual)	273.9135	241.2640	253.6623	216.4845	205.4523	180.3206	174.3772	183.9356	188.8851	216.3968	237.1863	270.0465 (45)
Distribution loss (46)m = 0.15 x (45)m												2641.9247
	41.0870	36.1896	38.0493	32.4727	30.8178	27.0481	26.1566	27.5903	28.3328	32.4595	35.5779	40.5070 (46)
Water storage loss (or HIU loss):												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6300 (48)
Temperature factor from Table 2b												0.7800 (49)
Enter (49) or (54) in (55)												1.2714 (55)
Total storage loss												
	39.4134	35.5992	39.4134	38.1420	39.4134	38.1420	39.4134	39.4134	38.1420	39.4134	38.1420	39.4134 (56)
If cylinder contains dedicated solar storage												
	39.4134	35.5992	39.4134	38.1420	39.4134	38.1420	39.4134	39.4134	38.1420	39.4134	38.1420	39.4134 (57)
Primary loss	54.8576	49.5488	54.8576	53.0880	54.8576	22.5120	23.2624	23.2624	22.5120	54.8576	53.0880	54.8576 (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												
	368.1845	326.4120	347.9333	307.7145	299.7233	240.9746	237.0530	246.6114	249.5391	310.6678	328.4163	364.3175 (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	368.1845	326.4120	347.9333	307.7145	299.7233	240.9746	237.0530	246.6114	249.5391	310.6678	328.4163	364.3175 (64)
												3627.5473 (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												
	134.9623	119.8593	128.2288	114.4515	112.1990	77.9662	76.5903	79.7685	80.8139	115.8380	121.3348	133.6766 (65)

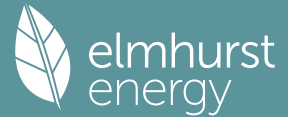
5. Internal gains (see Table 5 and 5a)												

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	169.5788	169.5788	169.5788	169.5788	169.5788	169.5788	169.5788	169.5788	169.5788	169.5788	169.5788	169.5788 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	31.0520	27.5801	22.4296	16.9807	12.6932	10.7162	11.5792	15.0511	20.2015	25.6505	29.9379	31.9150 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	409.5503	413.8002	403.0907	380.2914	351.5115	324.4624	306.3920	302.1421	312.8516	335.6509	364.4308	391.4799 (68)
Pumps, fans	54.7842	54.7842	54.7842	54.7842	54.7842	54.7842	54.7842	54.7842	54.7842	54.7842	54.7842	54.7842 (69)
Losses e.g. evaporation (negative values) (Table 5)	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)
Water heating gains (Table 5)	-113.0525	-113.0525	-113.0525	-113.0525	-113.0525	-113.0525	-113.0525	-113.0525	-113.0525	-113.0525	-113.0525	-113.0525 (71)
Total internal gains	181.4010	178.3621	172.3505	158.9604	150.8051	108.2864	102.9440	107.2158	112.2415	155.6963	168.5206	179.6728 (72)
	733.3137	731.0527	709.1812	667.5430	626.3203	554.7754	532.2257	535.7194	556.6051	628.3080	674.1997	714.3781 (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											
Northeast	4.9300											19.4716 (75)
Southeast	8.9700											110.9421 (77)
Southwest	0.8800											10.8840 (79)
Northwest	10.8900											43.0112 (81)

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Solar gains	184.3089	301.7291	458.2201	671.6339	808.9810	894.8773	838.8977	727.7471	568.5293	370.7587	230.1467	153.7178 (83)
Total gains	917.6226	1032.7819	1167.4013	1339.1769	1435.3013	1449.6527	1371.1233	1263.4665	1125.1344	999.0667	904.3464	868.0959 (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	67.1030	67.5246	67.5246	68.1276	68.1276	68.8730	68.6931	69.0483	68.8730	68.5089	68.5089	67.9306
alpha	5.4735	5.5016	5.5016	5.5418	5.5418	5.5915	5.5795	5.6032	5.5915	5.5673	5.5673	5.5287
util living area	0.9912	0.9826	0.9515	0.8462	0.6448	0.4090	0.2698	0.3005	0.5977	0.8933	0.9790	0.9931 (86)
Living	20.2246	20.3480	20.5670	20.8025	20.9179	20.9428	20.9443	20.9444	20.9319	20.7818	20.4760	20.2069
Non living	19.1188	19.2787	19.5486	19.8234	19.9327	19.9593	19.9575	19.9622	19.9539	19.8137	19.4517	19.1054
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	31	28	31	30	31	30	31	31	30	31	30	31
16 / 9	0	0	0	0	0	0	0	0	0	0	0	0
MIT	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000 (87)
Th 2	20.0081	20.0137	20.0137	20.0215	20.0215	20.0311	20.0288	20.0333	20.0311	20.0264	20.0264	20.0190 (88)
util rest of house	0.9882	0.9768	0.9356	0.8044	0.5756	0.3306	0.1853	0.2099	0.5053	0.8517	0.9707	0.9908 (89)
MIT 2	20.0081	20.0137	20.0137	20.0215	20.0215	20.0311	20.0288	20.0333	20.0311	20.0264	20.0264	20.0190 (90)
Living area fraction									fLA = Living area / (4) =			0.1571 (91)
MIT	20.1640	20.1687	20.1687	20.1753	20.1753	20.1833	20.1814	20.1852	20.1833	20.1794	20.1794	20.1731 (92)
Temperature adjustment												0.0000
adjusted MIT	20.1640	20.1687	20.1687	20.1753	20.1753	20.1833	20.1814	20.1852	20.1833	20.1794	20.1794	20.1731 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9888	0.9778	0.9384	0.8115	0.5868	0.3430	0.1986	0.2242	0.5203	0.8591	0.9722	0.9912 (94)
Useful gains	907.3244	1009.8470	1095.5414	1086.8005	842.3012	497.2613	272.3240	283.2268	585.3960	858.3458	879.1988	860.4485 (95)
Ext temp.	5.1000	5.6000	7.4000	9.9000	13.0000	16.0000	17.9000	17.8000	15.2000	11.6000	8.0000	5.1000 (96)
Heat loss rate W	1840.9131	1769.2680	1550.6698	1236.8233	863.6803	498.0943	272.3504	283.2773	593.3471	1026.9469	1457.8623	1819.5933 (97)
Space heating kWh	694.5899	510.3309	338.6156	108.0164	15.9061	0.0000	0.0000	0.0000	0.0000	125.4393	416.6377	713.6038 (98a)
Space heating requirement - total per year (kWh/year)												2923.1396
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	694.5899	510.3309	338.6156	108.0164	15.9061	0.0000	0.0000	0.0000	0.0000	125.4393	416.6377	713.6038 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2923.1396
Space heating per m2										(98c) / (4) =		26.0995 (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 %)												370.4278 (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	694.5899	510.3309	338.6156	108.0164	15.9061	0.0000	0.0000	0.0000	0.0000	125.4393	416.6377	713.6038 (98)
Space heating efficiency (main heating system 1)	370.4278	370.4278	370.4278	370.4278	370.4278	0.0000	0.0000	0.0000	0.0000	370.4278	370.4278	370.4278 (210)
Space heating fuel (main heating system)	187.5102	137.7680	91.4120	29.1599	4.2940	0.0000	0.0000	0.0000	0.0000	33.8634	112.4747	192.6431 (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	368.1845	326.4120	347.9333	307.7145	299.7233	240.9746	237.0530	246.6114	249.5391	310.6678	328.4163	364.3175 (64)
Efficiency of water heater (217)m	120.9600	120.9600	120.9600	120.9600	120.9600	120.9600	120.9600	120.9600	120.9600	120.9600	120.9600	120.9600 (216)
Fuel for water heating, kWh/month	304.3853	269.8512	287.6432	254.3936	247.7871	199.2184	195.9764	203.8785	206.2989	256.8351	271.5081	301.1884 (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	27.1796	21.8045	19.6325	14.3836	11.1103	9.0772	10.1352	13.1741	17.1119	22.4517	25.3592	27.9350 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-66.6450	-109.1609	-204.1551	-304.3735	-379.0609	-397.2431	-385.1803	-336.1205	-248.1116	-154.6676	-83.0269	-53.7979 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity) (233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												789.1253 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												120.9600
Water heating fuel used												2998.9644 (219)

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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)	219.3549 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-2721.5434 (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	1285.9012 (238)

10a. Fuel costs - using BEDF prices (596)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	789.1253	27.6700	218.3510 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2998.9644	27.6700	829.8134 (247)
Energy for instantaneous electric shower(s)	0.0000	27.6700	0.0000 (247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (249)
Energy for lighting	219.3549	27.6700	60.6955 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-2721.5434	27.6700	-753.0511
PV Unit electricity exported	0.0000	5.8100	0.0000
Total			-753.0511 (252)
Total energy cost			355.8089 (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	789.1253	0.1575	124.3197 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2998.9644	0.1416	424.5701 (264)
Space and water heating			548.8898 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	219.3549	0.1443	31.6597 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-2721.5434	0.1300	-353.8063
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-353.8063 (269)
Total CO2, kg/year			226.7432 (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	789.1253	1.5832	1249.3554 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2998.9644	1.5235	4569.0083 (278)
Space and water heating			5818.3637 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	219.3549	1.5338	336.4539 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-2721.5434	1.4802	-4028.3803
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-4028.3803 (283)
Total Primary energy kWh/year			2126.4372 (286)

SAP 10 EPC IMPROVEMENTS

design rev 2

Current energy efficiency rating: B 90
Current environmental impact rating: A 98

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

Recommended measures:	SAP change	Cost change	CO2 change
N Solar water heating	+ 2.7	-£ 126	-58 kg (25.4%)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
Solar water heating	£126	0.51 kg/m ²	A 93 A 98
Total Savings	£126	0.51 kg/m ²	

Potential energy efficiency rating: A 93
Potential environmental impact rating: A 98

Fuel prices for cost data on this page from database revision number 596 TEST (30 Jun 2026)
Recommendation texts revision number 6.1 (11 Jun 2019)

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Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£1109	£966	£143
Space heating	£218	£240	-£22
Water heating	£830	£664	£165
Lighting	£61	£61	£0
Generated (PV)	-£753	-£736	-£17
Total cost of fuels	£356	£230	£126
Total cost of uses	£356	£229	£126
Delivered energy	11 kWh/m ²	7 kWh/m ²	4 kWh/m ²
Carbon dioxide emissions	0.2 tonnes	0.2 tonnes	0.1 tonnes
CO2 emissions per m ²	2 kg/m ²	2 kg/m ²	1 kg/m ²
Primary energy	19 kWh/m ²	13 kWh/m ²	6 kWh/m ²

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	56.0000 (1b)	x 2.4000 (2b)	= 134.4000 (1b) - (3b)
First floor	56.0000 (1c)	x 2.6500 (2c)	= 148.4000 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	112.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 282.8000 (5)

2. Ventilation rate

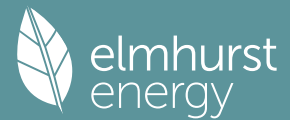
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	5 * 10 = 50.0000 (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) =	50.0000 / (5) = 0.1768 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.1000 (17)
Infiltration rate	0.4318 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3994 (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	0.5093	0.4993	0.4893	0.4394	0.4294	0.3794	0.3794	0.3695	0.3994	0.4294	0.4493	0.4693 (22b)
Effective ac	0.6297	0.6246	0.6197	0.5965	0.5922	0.5720	0.5720	0.5683	0.5798	0.5922	0.6010	0.6101 (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							
windows			25.6700	1.1450	29.3931		(27)
doors			2.1100	1.4000	2.9540		(26)
Heatloss Floor 1			56.0000	0.1000	5.6000	75.0000	4200.0000 (28a)
Heatloss Floor 2			1.7500	0.1800	0.3150	20.0000	35.0000 (28b)
External Wall 1	111.9100	27.7800	84.1300	0.1800	15.1434	140.0000	11778.2000 (29a)
External Roof 1	56.0000		56.0000	0.1200	6.7200	9.0000	504.0000 (30)
Total net area of external elements Aum(A, m ²)			225.6600				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		60.1255		(33)
Main dwelling							
Party Wall 1			68.6800	0.0000	0.0000	140.0000	9615.2000 (32)
Internal Wall 1			208.5700			9.0000	1877.1300 (32c)
Internal Floor 1			56.0000			18.0000	1008.0000 (32d)
Internal Ceiling 1			56.0000			9.0000	504.0000 (32e)
Heat capacity Cm = Sum (A x k)						(28)...(30) + (32) + (32a)...(32e) =	29521.5300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							263.5851 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E12 Gable (insulation at ceiling level)				5.0600	0.0430	0.2176	
E10 Eaves (insulation at ceiling level)				18.6000	0.0570	1.0602	
E21 Exposed floor (inverted)				3.0000	0.3200	0.9600	
P1 Party wall - Ground floor				12.4000	0.0500	0.6200	
P2 Party wall - Intermediate floor within a dwelling				12.4000	0.0000	0.0000	
P4 Party wall - Roof (insulation at ceiling level)				12.4000	0.0400	0.4960	
E16 Corner (normal)				17.3000	0.0420	0.7266	
E17 Corner (inverted - internal area greater than external area)				7.2000	-0.0850	-0.6120	

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E2 Other lintels (including other steel lintels)	19.6600	0.0250	0.4915	
E3 Sill	18.6600	0.0220	0.4105	
E4 Jamb	44.8000	0.0170	0.7616	
E5 Ground floor (normal)	23.0000	0.0750	1.7250	
E6 Intermediate floor within a dwelling	21.4000	0.0010	0.0214	
E18 Party wall between dwellings	10.1000	0.0330	0.3333	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				7.2117 (36)
Point Thermal bridges				0.0000
Total fabric heat loss		(33) + (36) + (36a) =		67.3372 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	58.7635	58.2936	57.8330	55.6695	55.2647	53.3804	53.3804	53.0315	54.1062	55.2647	56.0836	56.9397	(38)
Heat transfer coeff	126.1007	125.6308	125.1702	123.0067	122.6020	120.7176	120.7176	120.3687	121.4434	122.6020	123.4208	124.2769	(39)
Average = Sum(39)m / 12 =												123.0048	
HLP	1.1259	1.1217	1.1176	1.0983	1.0947	1.0778	1.0778	1.0747	1.0843	1.0947	1.1020	1.1096	(40)
HLP (average)												1.0983	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

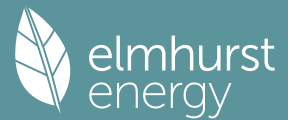
Assumed occupancy													2.8263 (42)
Hot water usage for mixer showers	98.4607	96.9810	94.8249	90.6994	87.6549	84.2598	82.3299	84.4698	86.8155	90.4609	94.6749	98.0835	(42a)
Hot water usage for baths	30.9169	30.4578	29.8112	28.6190	27.7263	26.7364	26.2017	26.8438	27.5429	28.6021	29.8188	30.8124	(42b)
Hot water usage for other uses	43.5743	41.9897	40.4052	38.8207	37.2362	35.6517	35.6517	37.2362	38.8207	40.4052	41.9897	43.5743	(42c)
Average daily hot water use (litres/day)												159.0553	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	172.9519	169.4285	165.0412	158.1391	152.6174	146.6478	144.1833	148.5498	153.1791	159.4682	166.4835	172.4701	(44)
Energy conte	273.9135	241.2640	253.6623	216.4845	205.4523	180.3206	174.3772	183.9356	188.8851	216.3968	237.1863	270.0465	(45)
Energy content (annual)										Total = Sum(45)m =		2641.9247	
Distribution loss (46)m = 0.15 x (45)m	41.0870	36.1896	38.0493	32.4727	30.8178	27.0481	26.1566	27.5903	28.3328	32.4595	35.5779	40.5070	(46)
Water storage loss (or HIU loss):												150.0000	(47)
Store volume												1.6300	(48)
a) If manufacturer declared loss factor is known (kWh/day):												0.7800	(49)
Temperature factor from Table 2b												1.2714	(55)
Enter (49) or (54) in (55)													
Total storage loss	39.4134	35.5992	39.4134	38.1420	39.4134	38.1420	39.4134	39.4134	38.1420	39.4134	38.1420	39.4134	(56)
If cylinder contains dedicated solar storage	39.4134	35.5992	39.4134	38.1420	39.4134	38.1420	39.4134	39.4134	38.1420	39.4134	38.1420	39.4134	(57)
Primary loss	54.8576	49.5488	54.8576	53.0880	54.8576	22.5120	23.2624	23.2624	22.5120	54.8576	53.0880	54.8576	(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	368.1845	326.4120	347.9333	307.7145	299.7233	240.9746	237.0530	246.6114	249.5391	310.6678	328.4163	364.3175	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Aperture area of solar collector												3.0000	(H1)
Zero-loss collector efficiency												0.8000	(H2)
Collector linear heat loss coefficient												1.8000	(H3)
Collector 2nd order heat loss coefficient												0.0000	(H4)
Collector loop efficiency												0.9000	(H5)
Incidence angle modifier												1.0000	(H6)
Overshading factor												0.8000	(H8)
Overall heat loss coefficient of system												6.5000	(H10)
Heat loss coefficient of collector loop												3.9667	(H11)
Dedicated solar storage volume												75.0000	(H12)
Effective solar volume												75.0000	(H14)
Reference volume												225.0000	(H15)
Storage tank correction coefficient												1.3161	(H16)
Heat delivered to hot water												660.8353	(H24)
Heat delivered to space heating												0.0000	(H29)
Solar input												660.8353	
Solar input	-0.0000	-16.1549	-60.3385	-85.0564	-114.4591	-103.7403	-103.2833	-88.9616	-59.8535	-28.9877	-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	368.1845	310.2571	287.5948	222.6581	185.2642	137.2343	133.7697	157.6498	189.6856	281.6801	328.4163	364.3175	(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	134.9623	119.8593	128.2288	114.4515	112.1990	77.9662	76.5903	79.7685	80.8139	115.8380	121.3348	133.6766	(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	169.5788	169.5788	169.5788	169.5788	169.5788	169.5788	169.5788	169.5788	169.5788	169.5788	169.5788	169.5788	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	31.0520	27.5801	22.4296	16.9807	12.6932	10.7162	11.5792	15.0511	20.2015	25.6505	29.9379	31.9150	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	409.5503	413.8002	403.0907	380.2914	351.5115	324.4624	306.3920	302.1421	312.8516	335.6509	364.4308	391.4799	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	54.7842	54.7842	54.7842	54.7842	54.7842	54.7842	54.7842	54.7842	54.7842	54.7842	54.7842	54.7842	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-113.0525	-113.0525	-113.0525	-113.0525	-113.0525	-113.0525	-113.0525	-113.0525	-113.0525	-113.0525	-113.0525	-113.0525	(71)
Water heating gains (Table 5)	181.4010	178.3621	172.3505	158.9604	150.8051	108.2864	102.9440	107.2158	112.2415	155.6963	168.5206	179.6728	(72)
Total internal gains	733.3137	731.0527	709.1812	667.5430	626.3203	554.7754	532.2257	535.7194	556.6051	628.3080	674.1997	714.3781	(73)

6. Solar gains

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[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	
Northeast	4.9300		11.2829		0.6300		0.7000		0.7700		16.9997 (75)	
Southeast	8.9700		36.7938		0.6300		0.7000		0.7700		100.8647 (77)	
Southwest	0.8800		36.7938		0.6300		0.7000		0.7700		9.8953 (79)	
Northwest	10.8900		11.2829		0.6300		0.7000		0.7700		37.5510 (81)	

Solar gains	165.3108	299.7049	458.1982	648.4009	799.8960	826.5002	783.3557	665.3819	523.2850	344.2146	201.3039	139.3364 (83)
Total gains	898.6244	1030.7577	1167.3794	1315.9439	1426.2162	1381.2756	1315.5814	1201.1014	1079.8901	972.5226	875.5037	853.7145 (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	65.0307	65.2740	65.5142	66.6665	66.8866	67.9306	67.9306	68.1276	67.5246	66.8866	66.4428	65.9851
alpha	5.3354	5.3516	5.3676	5.4444	5.4591	5.5287	5.5287	5.5418	5.5016	5.4591	5.4295	5.3990
util living area	0.9939	0.9865	0.9645	0.8918	0.7377	0.5492	0.4021	0.4576	0.7227	0.9345	0.9871	0.9953 (86)
Living	20.1037	20.2464	20.4653	20.7244	20.8819	20.9341	20.9424	20.9412	20.9035	20.6887	20.3520	20.0843
Non living	18.9420	19.1254	19.4010	19.7207	19.8857	19.9420	19.9466	19.9488	19.9168	19.6909	19.2738	18.9281
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	31	28	31	30	31	30	31	31	30	31	30	31
16 / 9	0	0	0	0	0	0	0	0	0	0	0	0
MIT	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000 (87)
Th 2	19.9797	19.9831	19.9865	20.0022	20.0052	20.0190	20.0190	20.0215	20.0137	20.0052	19.9992	19.9930 (88)
util rest of house	0.9918	0.9821	0.9529	0.8600	0.6773	0.4696	0.3134	0.3621	0.6396	0.9074	0.9821	0.9937 (89)
MIT 2	19.9797	19.9831	19.9865	20.0022	20.0052	20.0190	20.0190	20.0215	20.0137	20.0052	19.9992	19.9930 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	20.1401	20.1429	20.1458	20.1590	20.1615	20.1731	20.1731	20.1753	20.1687	20.1615	20.1565	20.1512 (91)
Temperature adjustment	0.0000											
adjusted MIT	20.1401	20.1429	20.1458	20.1590	20.1615	20.1731	20.1731	20.1753	20.1687	20.1615	20.1565	20.1512 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9922	0.9829	0.9550	0.8656	0.6874	0.4823	0.3274	0.3773	0.6536	0.9123	0.9830	0.9939 (94)
Useful gains	891.6104	1013.1173	1114.8086	1139.0445	980.3422	666.2492	430.7309	453.1312	705.7895	887.2334	860.6451	848.5464 (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	1997.4438	1914.9829	1708.0424	1384.9369	1037.3992	672.7758	431.3405	454.4268	736.9987	1172.2613	1611.4424	1982.3698 (97)
Space heating kWh	822.7400	606.0537	441.3659	177.0425	42.4504	0.0000	0.0000	0.0000	0.0000	212.0608	540.5741	843.5646 (98a)
Space heating requirement - total per year (kWh/year)	3685.8521											
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	822.7400	606.0537	441.3659	177.0425	42.4504	0.0000	0.0000	0.0000	0.0000	212.0608	540.5741	843.5646 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	3685.8521											
Space heating per m2	(98c) / (4) = 32.9094 (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 %)												370.9824 (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	822.7400	606.0537	441.3659	177.0425	42.4504	0.0000	0.0000	0.0000	0.0000	212.0608	540.5741	843.5646 (98)
Space heating efficiency (main heating system 1)	370.9824	370.9824	370.9824	370.9824	370.9824	0.0000	0.0000	0.0000	0.0000	370.9824	370.9824	370.9824 (210)
Space heating fuel (main heating system)	221.7733	163.3645	118.9722	47.7226	11.4427	0.0000	0.0000	0.0000	0.0000	57.1620	145.7142	227.3867 (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	368.1845	310.2571	287.5948	222.6581	185.2642	137.2343	133.7697	157.6498	189.6856	281.6801	328.4163	364.3175 (64)
Efficiency of water heater	120.9600	120.9600	120.9600	120.9600	120.9600	120.9600	120.9600	120.9600	120.9600	120.9600	120.9600	120.9600 (216)
Fuel for water heating, kWh/month	304.3853	256.4956	237.7602	184.0758	153.1616	113.4543	110.5900	130.3322	156.8168	232.8705	271.5081	301.1884 (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	6.7945	6.1370	6.7945	6.5753	6.7945	6.5753	6.7945	6.7945	6.5753	6.7945	6.5753	6.7945 (231)
Lighting	27.1796	21.8045	19.6325	14.3836	11.1103	9.0772	10.1352	13.1741	17.1119	22.4517	25.3592	27.9350 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-58.1910	-105.9057	-200.7444	-290.8843	-368.4525	-361.1675	-353.3350	-303.7600	-225.3786	-140.7970	-70.7925	-47.4359 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)

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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	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	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	0.0000	(235d)
Annual totals kWh/year														
Space heating fuel - main system 1													993.5382	(211)
Space heating fuel - main system 2													0.0000	(213)
Space heating fuel - secondary													0.0000	(215)
Efficiency of water heater													120.9600	
Water heating fuel used													2452.6389	(219)
Space cooling fuel													0.0000	(221)
Electricity for pumps and fans:														
pump for solar water heating													80.0000	(230g)
Total electricity for the above, kWh/year													80.0000	(231)
Electricity for lighting (calculated in Appendix L)													219.3549	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV generation													-2526.8444	(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													1218.6876	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	993.5382	16.4900	163.8344	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2452.6389	16.4900	404.4402	(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)
Pump for solar water heating	80.0000	16.4900	13.1920	(249)
Energy for lighting	219.3549	16.4900	36.1716	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-2526.8444	16.4900	-416.6766	
PV Unit electricity exported	0.0000	5.5900	0.0000	
Total			-416.6766	(252)
Total energy cost			200.9616	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)		0.4608	(257)
SAP value	$[(255) \times (256)] / [(4) + 45.0] =$	92.5304	
SAP rating (Section 12)		93	(258)
SAP band		A	

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

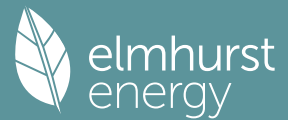
	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	993.5382	0.1567	155.6658	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2452.6389	0.1447	354.9523	(264)
Space and water heating			510.6181	(265)
Pumps, fans and electric keep-hot	80.0000	0.1387	11.0970	(267)
Energy for lighting	219.3549	0.1443	31.6597	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-2526.8444	0.1302	-329.0238	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-329.0238	(269)
Total CO2, kg/year			224.3509	(272)
CO2 emissions per m2			2.0000	(273)
EI value			98.0852	
EI rating			98	(274)
EI band			A	

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)	
Main dwelling				
Ground floor	56.0000 (1b)	x 2.4000 (2b)	= 134.4000	(1b) - (3b)
First floor	56.0000 (1c)	x 2.6500 (2c)	= 148.4000	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	112.0000			(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	282.8000	(5)

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2. Ventilation rate

												m3 per hour		
Number of open chimneys											0 * 80 =	0.0000 (6a)		
Number of open flues											0 * 20 =	0.0000 (6b)		
Number of chimneys / flues attached to closed fire											0 * 10 =	0.0000 (6c)		
Number of flues attached to solid fuel boiler											0 * 20 =	0.0000 (6d)		
Number of flues attached to other heater											0 * 35 =	0.0000 (6e)		
Number of blocked chimneys											0 * 20 =	0.0000 (6f)		
Number of intermittent extract fans											5 * 10 =	50.0000 (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) =										50.0000	/ (5) =	0.1768 (8)	
Pressure test													Yes	
Pressure Test Method													Blower Door	
Measured/design AP50													5.1000	(17)
Infiltration rate													0.4318	(18)
Number of sides sheltered													1	(19)
Shelter factor											(20) = 1 - [0.075 x (19)] =	0.9250	(20)	
Infiltration rate adjusted to include shelter factor											(21) = (18) x (20) =	0.3994	(21)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Wind speed	4.2000	4.0000	4.0000	3.7000	3.7000	3.3000	3.4000	3.2000	3.3000	3.5000	3.5000	3.8000	(22)	
Wind factor	1.0500	1.0000	1.0000	0.9250	0.9250	0.8250	0.8500	0.8000	0.8250	0.8750	0.8750	0.9500	(22a)	
Adj infilt rate	0.4194	0.3994	0.3994	0.3695	0.3695	0.3295	0.3395	0.3195	0.3295	0.3495	0.3495	0.3794	(22b)	
Effective ac	0.5879	0.5798	0.5798	0.5683	0.5683	0.5543	0.5576	0.5511	0.5543	0.5611	0.5611	0.5720	(25)	

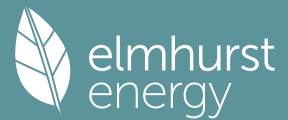
3. Heat losses and heat loss parameter

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								
windows			25.6700	1.1450	29.3931			(27)
doors			2.1100	1.4000	2.9540			(26)
Heatloss Floor 1			56.0000	0.1000	5.6000	75.0000	4200.0000	(28a)
Heatloss Floor 2			1.7500	0.1800	0.3150	20.0000	35.0000	(28b)
External Wall 1	111.9100	27.7800	84.1300	0.1800	15.1434	140.0000	11778.2000	(29a)
External Roof 1	56.0000		56.0000	0.1200	6.7200	9.0000	504.0000	(30)
Total net area of external elements Aum(A, m2)			225.6600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		60.1255			(33)
Main dwelling								
Party Wall 1			68.6800	0.0000	0.0000	140.0000	9615.2000	(32)
Internal Wall 1			208.5700			9.0000	1877.1300	(32c)
Internal Floor 1			56.0000			18.0000	1008.0000	(32d)
Internal Ceiling 1			56.0000			9.0000	504.0000	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		29521.5300	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							263.5851	(35)
List of Thermal Bridges								
K1 Element				Length	Psi-value		Total	
E12 Gable (insulation at ceiling level)				5.0600	0.0430		0.2176	
E10 Eaves (insulation at ceiling level)				18.6000	0.0570		1.0602	
E21 Exposed floor (inverted)				3.0000	0.3200		0.9600	
P1 Party wall - Ground floor				12.4000	0.0500		0.6200	
P2 Party wall - Intermediate floor within a dwelling				12.4000	0.0000		0.0000	
P4 Party wall - Roof (insulation at ceiling level)				12.4000	0.0400		0.4960	
E16 Corner (normal)				17.3000	0.0420		0.7266	
E17 Corner (inverted - internal area greater than external area)				7.2000	-0.0850		-0.6120	
E2 Other lintels (including other steel lintels)				19.6600	0.0250		0.4915	
E3 Sill				18.6600	0.0220		0.4105	
E4 Jamb				44.8000	0.0170		0.7616	
E5 Ground floor (normal)				23.0000	0.0750		1.7250	
E6 Intermediate floor within a dwelling				21.4000	0.0010		0.0214	
E18 Party wall between dwellings				10.1000	0.0330		0.3333	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								7.2117 (36)
Point Thermal bridges						(36a) =	0.0000	
Total fabric heat loss					(33) + (36) + (36a) =		67.3372	(37)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												
Hot water usage for mixer showers												
Hot water usage for baths												
Hot water usage for other uses												
Average daily hot water use (litres/day)												
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	172.9519	169.4285	165.0412	158.1391	152.6174	146.6478	144.1833	148.5498	153.1791	159.4682	166.4835	172.4701
Energy content (annual)	273.9135	241.2640	253.6623	216.4845	205.4523	180.3206	174.3772	183.9356	188.8851	216.3968	237.1863	270.0465
Total = Sum(45)m =												2641.9247

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Distribution loss (46)m = 0.15 x (45)m	41.0870	36.1896	38.0493	32.4727	30.8178	27.0481	26.1566	27.5903	28.3328	32.4595	35.5779	40.5070 (46)
Water storage loss (or HIU loss):												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6300 (48)
Temperature factor from Table 2b												0.7800 (49)
Enter (49) or (54) in (55)												1.2714 (55)
Total storage loss												
39.4134 35.5992 39.4134 38.1420 39.4134 38.1420 39.4134 39.4134 38.1420 39.4134 38.1420 39.4134 (56)												
If cylinder contains dedicated solar storage												
39.4134 35.5992 39.4134 38.1420 39.4134 38.1420 39.4134 39.4134 38.1420 39.4134 38.1420 39.4134 (57)												
Primary loss 54.8576 49.5488 54.8576 53.0880 54.8576 22.5120 23.2624 23.2624 22.5120 54.8576 53.0880 54.8576 (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												
368.1845 326.4120 347.9333 307.7145 299.7233 240.9746 237.0530 246.6114 249.5391 310.6678 328.4163 364.3175 (62)												
WWHRS 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (63a)												
PV diverter -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 (63b)												
Aperture area of solar collector												3.0000 (H1)
Zero-loss collector efficiency												0.8000 (H2)
Collector linear heat loss coefficient												1.8000 (H3)
Collector 2nd order heat loss coefficient												0.0000 (H4)
Collector loop efficiency												0.9000 (H5)
Incidence angle modifier												1.0000 (H6)
Overshading factor												0.8000 (H8)
Overall heat loss coefficient of system												6.5000 (H10)
Heat loss coefficient of collector loop												3.9667 (H11)
Dedicated solar storage volume												75.0000 (H12)
Effective solar volume												75.0000 (H14)
Reference volume												225.0000 (H15)
Storage tank correction coefficient												1.3161 (H16)
Heat delivered to hot water												723.2708 (H24)
Heat delivered to space heating												0.0000 (H29)
Solar input												723.2708
Solar input -0.0000 -17.5864 -61.4256 -89.9127 -116.7326 -114.7125 -112.7447 -100.8063 -69.2242 -36.3414 -3.7845 -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												
368.1845 308.8255 286.5077 217.8018 182.9908 126.2621 124.3084 145.8052 180.3149 274.3264 324.6317 364.3175 (64)												
Total per year (kWh/year) = Sum(64)m =												2904.2765 (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												
134.9623 119.8593 128.2288 114.4515 112.1990 77.9662 76.5903 79.7685 80.8139 115.8380 121.3348 133.6766 (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 169.5788 169.5788 169.5788 169.5788 169.5788 169.5788 169.5788 169.5788 169.5788 169.5788 169.5788 169.5788 (66)													
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
31.0520 27.5801 22.4296 16.9807 12.6932 10.7162 11.5792 15.0511 20.2015 25.6505 29.9379 31.9150 (67)													
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
409.5503 413.8002 403.0907 380.2914 351.5115 324.4624 306.3920 302.1421 312.8516 335.6509 364.4308 391.4799 (68)													
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
54.7842 54.7842 54.7842 54.7842 54.7842 54.7842 54.7842 54.7842 54.7842 54.7842 54.7842 54.7842 (69)													
Pumps, fans 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (70)													
Losses e.g. evaporation (negative values) (Table 5)													
-113.0525 -113.0525 -113.0525 -113.0525 -113.0525 -113.0525 -113.0525 -113.0525 -113.0525 -113.0525 -113.0525 -113.0525 (71)													
Water heating gains (Table 5)													
181.4010 178.3621 172.3505 158.9604 150.8051 108.2864 102.9440 107.2158 112.2415 155.6963 168.5206 179.6728 (72)													
Total internal gains													
733.3137 731.0527 709.1812 667.5430 626.3203 554.7754 532.2257 535.7194 556.6051 628.3080 674.1997 714.3781 (73)													

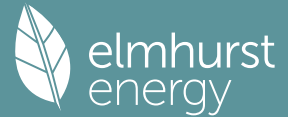
6. Solar gains

[Jan]												Gains
					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		W	
Northeast					4.9300	12.9236	0.6300	0.7000	0.7700		19.4716 (75)	
Southeast					8.9700	40.4699	0.6300	0.7000	0.7700		110.9421 (77)	
Southwest					0.8800	40.4699	0.6300	0.7000	0.7700		10.8840 (79)	
Northwest					10.8900	12.9236	0.6300	0.7000	0.7700		43.0112 (81)	
Solar gains	184.3089	301.7291	458.2201	671.6339	808.9810	894.8773	838.8977	727.7471	568.5293	370.7587	230.1467	153.7178 (83)
Total gains	917.6226	1032.7819	1167.4013	1339.1769	1435.3013	1449.6527	1371.1233	1263.4665	1125.1344	999.0667	904.3464	868.0959 (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	67.1030	67.5246	67.5246	68.1276	68.1276	68.8730	68.6931	69.0483	68.8730	68.5089	68.5089	67.9306
alpha	5.4735	5.5016	5.5016	5.5418	5.5418	5.5915	5.5795	5.6032	5.5915	5.5673	5.5673	5.5287
util living area												
	0.9912	0.9826	0.9515	0.8462	0.6448	0.4090	0.2698	0.3005	0.5977	0.8933	0.9790	0.9931 (86)
Living	20.2246	20.3480	20.5670	20.8025	20.9179	20.9428	20.9443	20.9444	20.9319	20.7818	20.4760	20.2069
Non living	19.1188	19.2787	19.5486	19.8234	19.9327	19.9593	19.9575	19.9622	19.9539	19.8137	19.4517	19.1054
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	31	28	31	30	31	30	31	31	30	31	30	31
16 / 9	0	0	0	0	0	0	0	0	0	0	0	0
MIT	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000 (87)
Th 2	20.0081	20.0137	20.0137	20.0215	20.0215	20.0311	20.0288	20.0333	20.0311	20.0264	20.0264	20.0190 (88)
util rest of house												
	0.9882	0.9768	0.9356	0.8044	0.5756	0.3306	0.1853	0.2099	0.5053	0.8517	0.9707	0.9908 (89)
MIT 2	20.0081	20.0137	20.0137	20.0215	20.0215	20.0311	20.0288	20.0333	20.0311	20.0264	20.0264	20.0190 (90)
Living area fraction									fLA =	Living area / (4) =		
MIT	20.1640	20.1687	20.1687	20.1753	20.1753	20.1833	20.1814	20.1852	20.1833	20.1794	20.1794	20.1731 (91)
Temperature adjustment												0.0000
adjusted MIT	20.1640	20.1687	20.1687	20.1753	20.1753	20.1833	20.1814	20.1852	20.1833	20.1794	20.1794	20.1731 (93)

Full SAP Calculation Printout



8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9888	0.9778	0.9384	0.8115	0.5868	0.3430	0.1986	0.2242	0.5203	0.8591	0.9722	0.9912	(94)
Useful gains	907.3244	1009.8470	1095.5414	1086.8005	842.3012	497.2613	272.3240	283.2268	585.3960	858.3458	879.1988	860.4485	(95)
Ext temp.	5.1000	5.6000	7.4000	9.9000	13.0000	16.0000	17.9000	17.8000	15.2000	11.6000	8.0000	5.1000	(96)
Heat loss rate W	1840.9131	1769.2680	1550.6698	1236.8233	863.6803	498.0943	272.3504	283.2773	593.3471	1026.9469	1457.8623	1819.5933	(97)
Space heating kWh	694.5899	510.3309	338.6156	108.0164	15.9061	0.0000	0.0000	0.0000	0.0000	125.4393	416.6377	713.6038	(98a)
Space heating requirement - total per year (kWh/year)												2923.1396	
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	694.5899	510.3309	338.6156	108.0164	15.9061	0.0000	0.0000	0.0000	0.0000	125.4393	416.6377	713.6038	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2923.1396	
Space heating per m2												26.0995	(99)

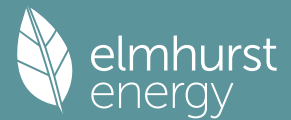
9a. Energy requirements - Individual heating systems, including micro-CHP

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 %)													370.4278	(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	694.5899	510.3309	338.6156	108.0164	15.9061	0.0000	0.0000	0.0000	0.0000	125.4393	416.6377	713.6038	(98)	
Space heating efficiency (main heating system 1)	370.4278	370.4278	370.4278	370.4278	370.4278	0.0000	0.0000	0.0000	0.0000	370.4278	370.4278	370.4278	(210)	
Space heating fuel (main heating system)	187.5102	137.7680	91.4120	29.1599	4.2940	0.0000	0.0000	0.0000	0.0000	33.8634	112.4747	192.6431	(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	368.1845	308.8255	286.5077	217.8018	182.9908	126.2621	124.3084	145.8052	180.3149	274.3264	324.6317	364.3175	(64)	
Efficiency of water heater	120.9600	120.9600	120.9600	120.9600	120.9600	120.9600	120.9600	120.9600	120.9600	120.9600	120.9600	120.9600	(216)	
Fuel for water heating, kWh/month	304.3853	255.3121	236.8615	180.0610	151.2820	104.3834	102.7682	120.5400	149.0699	226.7910	268.3794	301.1884	(217)	
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	6.7945	6.1370	6.7945	6.5753	6.7945	6.5753	6.7945	6.7945	6.5753	6.7945	6.5753	6.7945	(231)	
Lighting	27.1796	21.8045	19.6325	14.3836	11.1103	9.0772	10.1352	13.1741	17.1119	22.4517	25.3592	27.9350	(232)	
Electricity generated by PVs (Appendix M) (negative quantity)	-66.6466	-109.1507	-203.8706	-302.2126	-372.3134	-371.4958	-366.0953	-329.6208	-246.3820	-154.5445	-83.0292	-53.7989	(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)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)	
Electricity generated by wind turbines (Appendix M) (negative quantity)	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												789.1253	(211)	
Space heating fuel - main system 2												0.0000	(213)	
Space heating fuel - secondary												0.0000	(215)	
Efficiency of water heater												120.9600		
Water heating fuel used												2401.0222	(219)	
Space cooling fuel												0.0000	(221)	
Electricity for pumps and fans:														
pump for solar water heating												80.0000	(230g)	
Total electricity for the above, kWh/year												80.0000	(231)	
Electricity for lighting (calculated in Appendix L)												219.3549	(232)	
Energy saving/generation technologies (Appendices M ,N and Q)														
PV generation												-2659.1603	(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												830.3421	(238)	

10a. Fuel costs - using BEDF prices (596)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	789.1253	27.6700	218.3510	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2401.0222	27.6700	664.3629	(247)
Energy for instantaneous electric shower(s)	0.0000	27.6700	0.0000	(247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(249)
Pump for solar water heating	80.0000	27.6700	22.1360	(249)

Full SAP Calculation Printout



Energy for lighting	219.3549	27.6700	60.6955 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-2659.1603	27.6700	-735.7897
PV Unit electricity exported	0.0000	5.8100	0.0000
Total			-735.7897 (252)
Total energy cost			229.7557 (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	789.1253	0.1575	124.3197 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2401.0222	0.1451	348.5054 (264)
Space and water heating			472.8251 (265)
Pumps, fans and electric keep-hot	80.0000	0.1387	11.0970 (267)
Energy for lighting	219.3549	0.1443	31.6597 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-2659.1603	0.1303	-346.3984
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-346.3984 (269)
Total CO2, kg/year			169.1834 (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	789.1253	1.5832	1249.3554 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2401.0222	1.5369	3690.1659 (278)
Space and water heating			4939.5213 (279)
Pumps, fans and electric keep-hot	80.0000	1.5128	121.0240 (281)
Energy for lighting	219.3549	1.5338	336.4539 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-2659.1603	1.4812	-3938.6986
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-3938.6986 (283)
Total Primary energy kWh/year			1458.3005 (286)

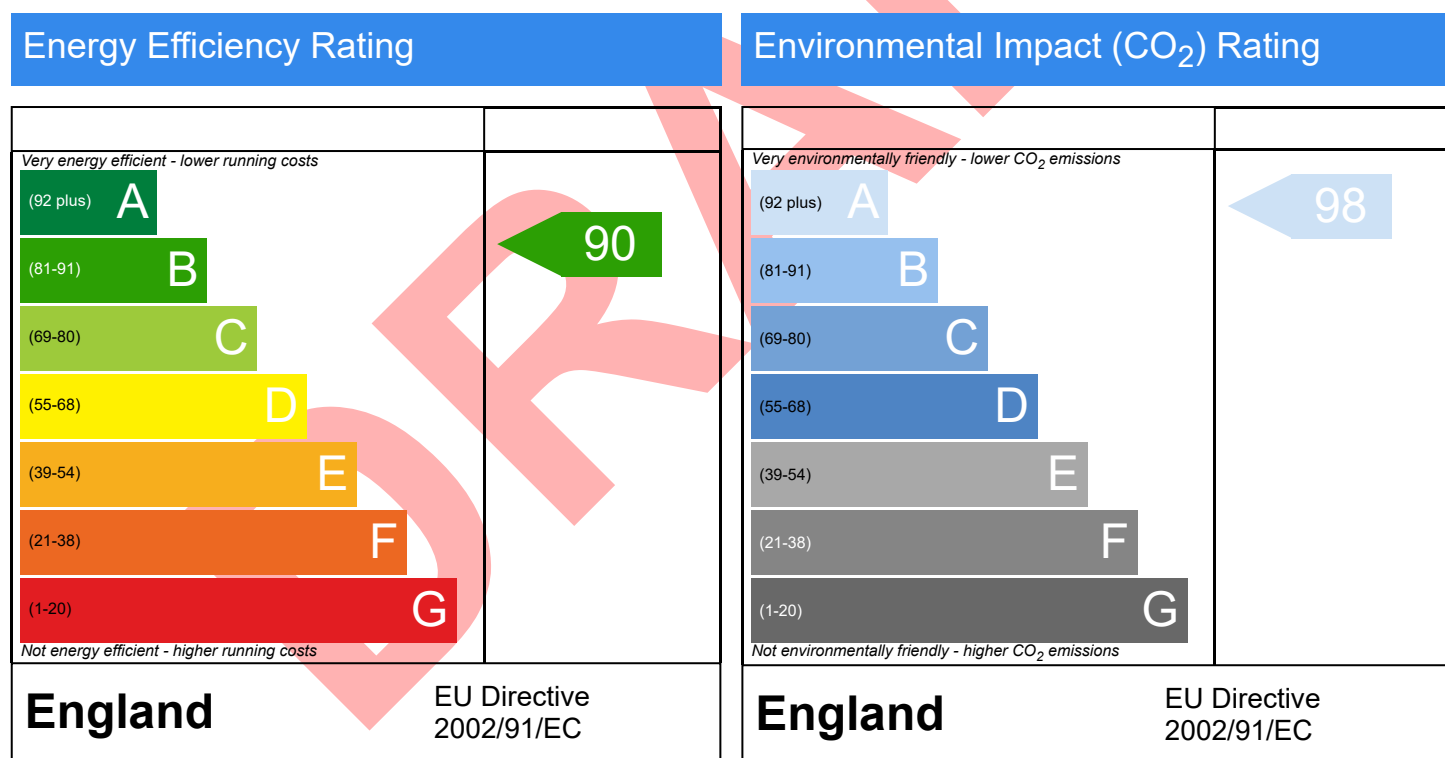
Predicted Energy Assessment



Dwelling type: House, Semi-Detached
Date of assessment: 04/08/2026
SAP Version: 10.2
Produced by: Mike Ovenden
Total floor area: 112 m²
DRRN:

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	Plot 2 134 High Street Kimpton		Issued on Date	04/08/2026
Assessment Reference	design rev 2	Plot Type Ref	Design	
Plot Address			SAP Version	10.2

SAP Rating	90 B	DER	2.59	TER	10.44
Environmental	98 A	% DER < TER			75.19
CO ₂ Emissions (t/year)	0.23	DFEE	37.00	TFEE	40.25
Compliance Check	See BREL	% DFEE < TFEE			8.06
% DPER < TPER	54.16	DPER	24.95	TPER	54.43

Assessor Details	Mr. Mike Ovenden	Assessor ID	H824-0001
Client	11, Alison Swarbrick		

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

Orientation	Southeast	
Property Tenture	ND	
Transaction Type	6	
Terrain Type	Suburban	
1.0 Property Type	House, Semi-Detached	
2.0 Number of Storeys	2	
3.0 Date Built	2026	
4.0 Sheltered Sides	1	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	263.59	kJ/m²K
7.0 Electricity Tariff		
Smart electricity meter fitted	No	
Smart gas meter fitted	No	

7.0 Measurements	Ground floor:	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
	1st Storey:	23.00 m	56.00 m ²	2.40 m
		21.40 m	56.00 m ²	2.65 m

8.0 Living Area	17.60	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, lightweight aggregate block, filled cavity, any outside structure	0.18	140.00	111.91	84.13	0.00	None	27.78	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	Dense plaster both sides. lightweight aggregate blocks, cavity or cavity fill	0.00	140.00	68.68		None

9.2 Internal Walls	Description	Construction	Kappa (kJ/m ² K)	Area (m ²)
	Internal Wall 1	Plasterboard on timber frame	9.00	208.57

10.0 External Roofs	Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area(m ²)	Nett Area (m ²)	Shelter Code	Shelter Factor	Calculation Type	Openings
	External Roof 1	External Plane Roof	Plasterboard, insulated at ceiling level	0.12	9.00	56.00	56.00	None	0.00	Calculate Wall Area	0.00

10.2 Internal Ceilings	Description	Storey	Construction	Kappa	Area (m ²)
	Internal Ceiling 1	Lowest occupied	Plasterboard ceiling, carpeted chipboard floor	9.00	56.00

11.0 Heat Loss Floors	Description	Type	Storey Index	Construction	U-Value (W/m ² K)	Shelter Code	Shelter Factor	Kappa (kJ/m ² K)	Area (m ²)
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Summary for Input Data



Heatloss Floor 1	Ground Floor - Solid	Lowest occupied	Suspended concrete floor, carpeted	0.10	None	0.00	75.00	56.00
Heatloss Floor 2	Exposed Floor -	+1	Timber exposed floor, insulation between joists	0.18	None	0.00	20.00	1.75
	Timber							

11.2 Internal Floors

Description	Storey Index	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Floor 1	+1	Plasterboard ceiling, carpeted chipboard floor	18.00	56.00

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
windows	Manufacturer	Window	Double Low-E Soft 0.05			0.63		0.70	1.20
doors	Manufacturer	Solid Door				0.00			1.40

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
windows front	windows	External Wall 1	South East	8.97	
windows side	windows	External Wall 1	North East	4.93	
windows rear	windows	External Wall 1	North West	10.89	
windows side	windows	External Wall 1	South West	0.88	
windows front	doors	External Wall 1	South East	2.11	

14.0 Conservatory

15.0 Draught Proofing

 %

16.0 Draught Lobby

17.0 Thermal Bridging

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted Reference:	Imported
E12 Gable (insulation at ceiling level)	Independently assessed	5.06	0.04	0.04 cert supplied	No
E10 Eaves (insulation at ceiling level)	Independently assessed	18.60	0.06	0.06 cert supplied	No
E21 Exposed floor (inverted)	Table K1 - Default	3.00	0.32	0.32	No
P1 Party wall - Ground floor	Independently assessed	12.40	0.05	0.05 cert supplied	No
P2 Party wall - Intermediate floor within a dwelling	Table K1 - Default	12.40	0.00	0.00	No
P4 Party wall - Roof (insulation at ceiling level)	Independently assessed	12.40	0.04	0.04 cert supplied	No
E16 Corner (normal)	Independently assessed	17.30	0.04	0.04 cert supplied	No
E17 Corner (inverted – internal area greater than external area)	Independently assessed	7.20	-0.09	-0.09 cert supplied	No
E2 Other lintels (including other steel lintels)	Independently assessed	19.66	0.03	0.03 cert supplied	No
E3 Sill	Independently assessed	18.66	0.02	0.02 cert supplied	No
E4 Jamb	Independently assessed	44.80	0.02	0.02 cert supplied	No
E5 Ground floor (normal)	Independently assessed	23.00	0.07	0.07 cert supplied	Yes
E6 Intermediate floor within a dwelling	Independently assessed	21.40	0.00	0.00 cert supplied	Yes
E18 Party wall between dwellings	Independently assessed	10.10	0.03	0.03 cert supplied	Yes

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 m³/(h.m²) @ 50 Pa

Test Method

22.0 Lighting

No Fixed Lighting

Name	Efficacy	Power	Capacity	Count
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Summary for Input Data

Lighting 1 95.00 11.00 1045.00 30

24.0 Main Heating 1

Database		
Percentage of Heat	100.00	%
Database Ref. No.	100612	
Fuel Type	Electricity	
In Winter	370.98	
In Summer	120.96	
Model Name	geoTHERM air 4kW	
Manufacturer	Vaillant Group UK Ltd	
System Type	Heat Pump	
Controls SAP Code	2207	
Controls description	Time and temperature zone control by arrangement	
Is MHS Pumped	Pump in heated space	
Heating Pump Age	2013 or later	
Heat Emitter	Radiators and Underfloor	
Underfloor Heating	Yes - Pipes in thin screed	
Flow Temperature	Enter value	
Flow Temperature Value	45.00	

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

28.1 Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
ensuite	Combi boiler or unvented hot water system	11.00		No	

28.3 Waste Water Heat Recovery System

29.0 Hot Water Cylinder

Hot Water Cylinder		
Cylinder Stat	No	
Cylinder In Heated Space	No	
Independent Time Control	No	
Insulation Type	Measured Loss	
Cylinder Volume	150.00	L
Loss	1.63	kWh/day
Pipes insulation	Fully insulated primary pipework	

31.0 Thermal Store

None

Summary for Input Data

32.0 Photovoltaic Unit

Export Capable Meter?	One Dwelling
Connected To Dwelling	No
Diverter	Yes
Battery Capacity [kWh]	No
	11.50

PV Cells kWp	Orientation	Elevation	Overshading	FGHRS	MCS Certificate	Overshading Factor	MCS Certificate Reference	Panel Manufacturer
4.60	East	30°	Modest		No	0.80		

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	£4,000 - £7,000	£126	A 93	A 98
Photovoltaic			0	0
Wind turbine			0	0

Thermal Bridging

Plot Reference	Plot 2 134 High Street Kimpton		Issued on Date	04/08/2026
Assessment Reference	design rev 2	Plot Type Ref	Semi-Detached House	
Plot Address			SAP Version	10.2

SAP Rating	90 B	DER	2.59	TER	10.44
Environmental	98 A	% DER < TER			75.19
CO ₂ Emissions (t/year)	0.23	DFEE	37.00	TFEE	40.25
Compliance Check	See BREL	% DFEE < TFEE			8.06
% DPER < TPER	54.16	DPER	24.95	TPER	54.43

Assessor Details	Mr. Mike Ovenden	Assessor ID	H824-0001
Client	11, Alison Swarbrick		

	Junction details	Source Type	Psi (W/mK)	Length (m)	Result	Reference
External wall	E12 Gable (insulation at ceiling level)	Independently assessed	0.043	5.06	0.22	cert supplied
External wall	E10 Eaves (insulation at ceiling level)	Independently assessed	0.057	18.60	1.06	cert supplied
External wall	E21 Exposed floor (inverted)	Table K1 - Default	0.320	3.00	0.96	
Party wall	P1 Party wall - Ground floor	Independently assessed	0.050	12.40	0.62	cert supplied
Party wall	P2 Party wall - Intermediate floor within a dwelling	Table K1 - Default	0.000	12.40	0.00	
Party wall	P4 Party wall - Roof (insulation at ceiling level)	Independently assessed	0.040	12.40	0.50	cert supplied
External wall	E16 Corner (normal)	Independently assessed	0.042	17.30	0.73	cert supplied
External wall	E17 Corner (inverted – internal area greater than external area)	Independently assessed	-0.085	7.20	-0.61	cert supplied
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.025	19.66	0.49	cert supplied
External wall	E3 Sill	Independently assessed	0.022	18.66	0.41	cert supplied
External wall	E4 Jamb	Independently assessed	0.017	44.80	0.76	cert supplied
External wall	E5 Ground floor (normal)	Independently assessed	0.075	23.00	1.72	cert supplied
External wall	E6 Intermediate floor within a dwelling	Independently assessed	0.001	21.40	0.02	cert supplied
External wall	E18 Party wall between dwellings	Independently assessed	0.033	10.10	0.33	cert supplied

Total: 225.98 W/mK:
Y-Value: 0.03 W/m²K: