

Building Regulations England Part L (BREL) Compliance Report

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

Date: Tue 19 Dec 2023 09:47:23

Project Information			
Assessed By	Stuart Foster	Building Type	House, Detached
OCDEA Registration	EES/030270	Assessment Date	2023-12-19

Dwelling Details			
Assessment Type	As designed	Total Floor Area	247 m ²
Site Reference	House	Plot Reference	03_BWA specification
Address	Plot 4A Trevarrick Road, St Austell, PL25 5JN		

Client Details	
Name	Andrew Phillimore
Company	Array
Address	[REDACTED]

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	10.08 kgCO ₂ /m ²		
Dwelling carbon dioxide emission rate	1.06 kgCO ₂ /m ²		OK
1b Target primary energy rate and dwelling primary energy			
Target primary energy	53.04 kWh _{PE} /m ²		
Dwelling primary energy	10.59 kWh _{PE} /m ²		OK
1c Target fabric energy efficiency and dwelling fabric energy efficiency			
Target fabric energy efficiency	45.0 kWh/m ²		
Dwelling fabric energy efficiency	36.5 kWh/m ²		OK

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

2b Envelope elements (better than typically expected values are flagged with a subsequent (!))		
Name	Net area [m ²]	U-Value [W/m ² K]
Exposed wall: Walls (1)	270.08885	0.16
Ground floor: Lower Ground Floor, Lower Ground Floor	83.93	0.11
Ground floor: Ground Floor, Ground Floor	7.69	0.11
Exposed roof: Roof (1)	3.71	0.13
Exposed roof: Roof (2)	5.39	0.13
Exposed roof: Roof (3)	5.08	0.13
Exposed roof: Roof (4)	7.69	0.13
Exposed roof: Roof (5)	49.45	0.12
Exposed roof: Roof (6)	22.86	0.13

2c Openings (better than typically expected values are flagged with a subsequent (!))				
Name	Area [m ²]	Orientation	Frame factor	U-Value [W/m ² K]
SE windows (LGF), Typical Window	2.34	South East	1.0	1 (!)
SE windows (LGF), Typical Window	0.975	South East	1.0	1 (!)
SE windows (LGF), Typical Window	2.898	South East	1.0	1 (!)
SE windows (LGF), Typical Window	2.73	South East	1.0	1 (!)
SE Windows (GF), Typical Window	1.02	South East	1.0	1 (!)
SE Windows (GF), Typical Window	1.53	South East	1.0	1 (!)
SE Windows (GF), Typical Window	4.053	South East	1.0	1 (!)
SE Windows (GF), Typical Window	2.856	South East	1.0	1 (!)

Name	Area [m ²]	Orientation	Frame factor	U-Value [W/m ² K]
SE Windows (GF), Typical Window	1.95	South East	1.0	1 (!)
SE Windows (FF), Typical Window	0.99015	South East	1.0	1 (!)
SE Windows (FF), Typical Window	1.755	South East	1.0	1 (!)
SE Windows (FF), Typical Window	1.755	South East	1.0	1 (!)
SE Windows (FF), Typical Window	1.98	South East	1.0	1 (!)
NE windows (GF & FF), Typical Window	1.0855	North East	1.0	1 (!)
NE windows (GF & FF), Typical Window	0.7865	North East	1.0	1 (!)
SW windows (GF), Typical Window	1.05	South West	1.0	1 (!)
SW windows (GF), Typical Window	0.63	South West	1.0	1 (!)
SW windows (GF), Typical Window	4.515	South West	1.0	1 (!)
SW windows (GF), Typical Window	2.961	South West	1.0	1 (!)
SW windows (FF), Typical Window	0.825	South West	1.0	1 (!)
SW doors (GF), Entrance Door	1.89	South West	N/A	1 (!)
NW doors (GF), Entrance Door	1.89	North West	N/A	1 (!)
NW windows (GF), Typical Window	0.72	North West	1.0	1 (!)
NW windows (GF), Typical Window	0.72	North West	1.0	1 (!)
NW windows (GF), Typical Window	0.72	North West	1.0	1 (!)
NW windows (GF), Typical Window	1.44	North West	1.0	1 (!)
NW windows (FF), Typical Window	1.176	North West	1.0	1 (!)

2d Thermal bridging (better than typically expected values are flagged with a subsequent (!))

Building part 1 - Main Dwelling: Thermal bridging calculated from linear thermal transmittances for each junction

Main element	Junction detail	Source	Psi value [W/mK]	Drawing / reference
External wall	E1: Steel lintel with perforated steel base plate	Not government-approved scheme	0.028 (!)	RCD E2-02
External wall	E3: Sill	Not government-approved scheme	0.027 (!)	RCD E3-01
External wall	E4: Jamb	Not government-approved scheme	0.021 (!)	RCD E4-01
External wall	E5: Ground floor (normal)	Not government-approved scheme	0.161	RCD E5-12
External wall	E6: Intermediate floor within a dwelling	Not government-approved scheme	0.002 (!)	RCD E6-01
External wall	E8: Balcony within a dwelling - wall insulation continuous	SAP table default	0.1	
External wall	E14: Flat roof	SAP table default	0.16	
External wall	E15: Flat roof with parapet	SAP table default	0.3	
External wall	E16: Corner (normal)	Not government-approved scheme	0.048	RCD E16-01
External wall	E17: Corner (inverted - internal area greater than external area)	Not government-approved scheme	-0.081	RCD E17-01
External wall	E22: Basement floor	SAP table default	0.22	
External wall	E24: Eaves (insulation at ceiling level - inverted)	SAP table default	0.15	

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

Maximum permitted air permeability at 50Pa	8 m ³ /hm ²	
Dwelling air permeability at 50Pa	2 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	313.8%
Emitter type	Underfloor
Flow temperature	45°C
System type	Heat Pump
Manufacturer	Mitsubishi Electric Europe B.V.
Model	Ecodan 8.5 kW
Commissioning	

Secondary heating system: Closed room heater	
Fuel	Wood logs
Efficiency	65.0%
Commissioning	

5 Hot water

Cylinder/store - type: Cylinder	
Capacity	300 litres
Declared heat loss	1.9 kWh/day
Primary pipework insulated	Yes
Manufacturer	
Model	
Commissioning	
Waste water heat recovery system 1 - type: N/A	
Efficiency	
Manufacturer	
Model	

6 Controls

Main heating 1 - type: Programmer and at least two room thermostats	
Function	
Ecodesign class	
Manufacturer	
Model	
Water heating - type: Cylinder thermostat and HW separately timed	
Manufacturer	
Model	

7 Lighting

<i>Minimum permitted light source efficacy</i>	75 lm/W	
Lowest light source efficacy	80 lm/W	OK
External lights control	N/A	

8 Mechanical ventilation

System type: Balanced whole-house mechanical ventilation with heat recovery		
<i>Maximum permitted specific fan power</i>	1.5 W/(l/s)	
Specific fan power	1.27 W/(l/s)	OK
<i>Minimum permitted heat recovery efficiency</i>	73%	
Heat recovery efficiency	82%	OK
Manufacturer/Model	HRV1.65 Q Plus Eco	
Commissioning		

9 Local generation

Technology type: Photovoltaic system (1)	
Peak power	6.48 kWp
Orientation	South West
Pitch	Horizontal
Overshading	0.8 (overshading factor calculated according to MCS)
Manufacturer	16no. Marley M10 405Wp panels
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:

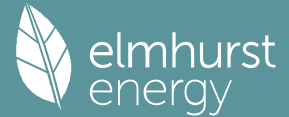
Name:

Date:

b. Client Declaration

N/A

Full SAP Calculation Printout



Property Reference	House		Issued on Date	19/12/2023	
Assessment Reference	03_BWA specification	Prop Type Ref			
Property	Plot 4A, Trevarrick Road, St Austell, Cornwall, PL25 5JN				
SAP Rating	95 A	DER	1.06	TER	10.08
Environmental	99 A	% DER < TER		89.48	
CO ₂ Emissions (t/year)	0.09	DFEE	36.52	TFEE	44.95
Compliance Check	See BREL	% DFEE < TFEE		18.75	
% DPER < TPER	80.04	DPER	10.59	TPER	53.04
Assessor Details	Mr. Stuart Foster			Assessor ID	CK03-0001
Client	CL2310006, Andrew Phillimore				

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)
Basement floor	83.9300 (1a)	x 2.5200 (2a)	= 211.5036 (1a) - (3a)
Ground floor	90.4700 (1b)	x 2.7500 (2b)	= 248.7925 (1b) - (3b)
First floor	72.3100 (1c)	x 2.6700 (2c)	= 193.0677 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	246.7100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 653.3638 (5)

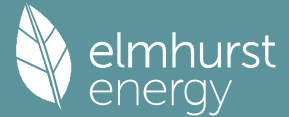
2. Ventilation rate

	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	1 * 10 = 10.0000 (6c)											
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)											
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)											
Number of blocked chimneys	0 * 20 = 0.0000 (6f)											
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)											
Number of passive vents	0 * 10 = 0.0000 (7b)											
Number of flueless gas fires	0 * 40 = 0.0000 (7c)											
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) = 10.0000 / (5) = 0.0153 (8)											
Pressure test	Yes											
Pressure Test Method	Blower Door											
Measured/design AP50	2.0000 (17)											
Infiltration rate	0.1153 (18)											
Number of sides sheltered	0 (19)											
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)											
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1153 (21)											
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1470	0.1441	0.1412	0.1268	0.1240	0.1095	0.1095	0.1067	0.1153	0.1240	0.1297	0.1355 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation	0.5000 (23a)											
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)											
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	73.8000 (23c)											
Effective ac	0.2780	0.2751	0.2722	0.2578	0.2550	0.2405	0.2405	0.2377	0.2463	0.2550	0.2607	0.2665 (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
Typical Window (Uw = 1.00)			43.4700	0.9615	41.7981		(27)
Entrance Door			3.7800	1.0000	3.7800		(26a)
Lower Ground Floor			83.9300	0.1100	9.2323	110.0000	9232.3000 (28a)
Ground Floor			7.6900	0.1100	0.8459	110.0000	845.9000 (28a)
Typical External Wall	317.3323	47.2500	270.0823	0.1600	43.2132	110.0000	29709.0530 (29a)
LGF Exposed Roof	3.7100		3.7100	0.1300	0.4823	9.0000	33.3900 (30)
GF Exposed Roof (Living Room)	5.3900		5.3900	0.1300	0.7007	9.0000	48.5100 (30)
GF Exposed Roof (Kitchen)	5.0800		5.0800	0.1300	0.6604	9.0000	45.7200 (30)
GF Exposed Roof (Breakfast)	7.6900		7.6900	0.1300	0.9997	9.0000	69.2100 (30)
FF Main Roof	49.4500		49.4500	0.1200	5.9340	9.0000	445.0500 (30)
FF Parapet Roof	22.8600		22.8600	0.1300	2.9718	9.0000	205.7400 (30)
Total net area of external elements Aum(A, m ²)			503.1323				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	110.6183	(33)

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LGF Blockwork	54.4100	75.0000	4080.7500 (32c)
LGF Studwork	92.0400	9.0000	828.3600 (32c)
GF Blockwork	51.6500	75.0000	3873.7500 (32c)
FF Blockwork	17.0900	75.0000	1281.7500 (32c)
GF Studwork	91.1800	9.0000	820.6200 (32c)
FF Studwork	87.2900	9.0000	785.6100 (32c)
GF Floor	82.7900	18.0000	1490.2200 (32d)
FF Floor	72.3100	18.0000	1301.5800 (32d)
LGF Internal Ceiling	80.2300	9.0000	722.0700 (32e)
GF Internal Ceiling	72.3100	9.0000	650.7900 (32e)

Heat capacity Cm = Sum(A x k)
 Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K (28)...(30) + (32) + (32a)...(32e) = 56470.3730 (34)
 List of Thermal Bridges 228.8937 (35)

K1 Element	Length	Psi-value	Total
E1 Steel lintel with perforated steel base plate	31.3500	0.0280	0.8778
E3 Sill	29.5500	0.0270	0.7979
E4 Jamb	81.6800	0.0210	1.7153
E5 Ground floor (normal)	45.9890	0.1610	7.4042
E6 Intermediate floor within a dwelling	73.7030	0.0020	0.1474
E8 Balcony within a dwelling, wall insulation continuous	17.6590	0.1000	1.7659
E14 Flat roof	51.9530	0.1600	8.3125
E15 Flat roof with parapet	13.6590	0.3000	4.0977
E16 Corner (normal)	43.1900	0.0480	2.0731
E17 Corner (inverted - internal area greater than external area)	10.9300	-0.0810	-0.8853
E22 Basement floor	25.9780	0.2200	5.7152
E24 Eaves (insulation at ceiling level - inverted)	18.7760	0.1500	2.8164

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 34.8380 (36)
 Point Thermal bridges 0.0000
 Total fabric heat loss (33) + (36) + (36a) = 145.4563 (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	59.9427	59.3212	58.6996	55.5920	54.9705	51.8629	51.8629	51.2413	53.1059	54.9705	56.2135	57.4566 (38)
Average = Sum(39)m / 12 =	205.3990	204.7775	204.1560	201.0484	200.4268	197.3192	197.3192	196.6977	198.5623	200.4268	201.6699	202.9129 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.8326	0.8300	0.8275	0.8149	0.8124	0.7998	0.7998	0.7973	0.8048	0.8124	0.8174	0.8225 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

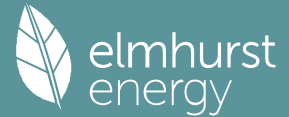
4. Water heating energy requirements (kWh/year)

Assumed occupancy	3.0627 (42)											
Hot water usage for mixer showers	25.1902	24.8116	24.2600	23.2045	22.4256	21.5570	21.0633	21.6107	22.2109	23.1435	24.2216	25.0937 (42a)
Hot water usage for baths	32.6210	32.1365	31.4543	30.1964	29.2545	28.2101	27.6459	28.3234	29.0610	30.1786	31.4624	32.5107 (42b)
Hot water usage for other uses	45.9946	44.3221	42.6496	40.9770	39.3045	37.6320	37.6320	39.3045	40.9770	42.6496	44.3221	45.9946 (42c)
Average daily hot water use (litres/day)	95.2826 (43)											
Daily hot water use	103.8058	101.2702	98.3638	94.3779	90.9846	87.3990	86.3412	89.2386	92.2489	95.9716	100.0061	103.5990 (44)
Energy content (annual)	164.4030	144.2075	151.1816	129.1987	122.4828	107.4673	104.4221	110.4960	113.7521	130.2326	142.4770	162.2110 (45)
Distribution loss (46)m = 0.15 x (45)m	Total = Sum(45)m = 1582.5317											
Water storage loss:	24.6605	21.6311	22.6772	19.3798	18.3724	16.1201	15.6633	16.5744	17.0628	19.5349	21.3716	24.3317 (46)
Store volume	300.0000 (47)											
a) If manufacturer declared loss factor is known (kWh/day):	1.9000 (48)											
Temperature factor from Table 2b	0.5400 (49)											
Enter (49) or (54) in (55)	1.0260 (55)											
Total storage loss	31.8060	28.7280	31.8060	30.7800	31.8060	30.7800	31.8060	31.8060	30.7800	31.8060	30.7800	31.8060 (56)
If cylinder contains dedicated solar storage	31.8060	28.7280	31.8060	30.7800	31.8060	30.7800	31.8060	31.8060	30.7800	31.8060	30.7800	31.8060 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	219.4714	193.9467	206.2500	182.4907	177.5512	160.7593	159.4905	165.5644	167.0441	185.3010	195.7690	217.2794 (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	219.4714	193.9467	206.2500	182.4907	177.5512	160.7593	159.4905	165.5644	167.0441	185.3010	195.7690	217.2794 (64)
12Total per year (kWh/year)	Total per year (kWh/year) = Sum(64)m = 2230.9177 (64)											
Electric shower(s)	40.3463	35.9488	39.2548	37.4603	38.1633	36.4041	37.6175	38.1633	37.4603	39.2548	38.5166	40.3463 (64a)
Heat gains from water heating, kWh/month	108.8053	96.7276	104.1363	94.9572	94.3211	87.4675	88.1795	90.3355	89.8213	97.1707	99.6364	108.0764 (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	153.1326	153.1326	153.1326	153.1326	153.1326	153.1326	153.1326	153.1326	153.1326	153.1326	153.1326	153.1326 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	208.6389	230.9931	208.6389	215.5935	208.6389	215.5935	208.6389	208.6389	215.5935	208.6389	215.5935	208.6389 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	413.5222	417.8132	406.9999	383.9796	354.9205	327.6091	309.3634	305.0724	315.8857	338.9060	367.9651	395.2765 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	38.3133	38.3133	38.3133	38.3133	38.3133	38.3133	38.3133	38.3133	38.3133	38.3133	38.3133	38.3133 (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)	-122.5061	-122.5061	-122.5061	-122.5061	-122.5061	-122.5061	-122.5061	-122.5061	-122.5061	-122.5061	-122.5061	-122.5061 (71)
Water heating gains (Table 5)	146.2437	143.9398	139.9681	131.8851	126.7756	121.4826	118.5208	121.4186	124.7517	130.6058	138.3838	145.2640 (72)
Total internal gains												

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837.3446 861.6859 824.5467 800.3980 759.2748 733.6251 705.4629 704.0697 725.1708 747.0906 790.8823 818.1192 (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		1.8700	11.2829	0.5700	1.0000	0.7700	8.3344 (75)					
Southeast		26.8300	36.7938	0.5700	1.0000	0.7700	389.9454 (77)					
Southwest		9.9900	36.7938	0.5700	1.0000	0.7700	145.1940 (79)					
Northwest		4.7800	11.2829	0.5700	1.0000	0.7700	21.3039 (81)					
Solar gains	564.7776	971.8698	1355.9037	1723.8602	1970.8730	1974.2179	1896.0336	1709.0607	1482.9097	1081.1736	678.2662	482.1718 (83)
Total gains	1402.1221	1833.5557	2180.4504	2524.2582	2730.1478	2707.8430	2601.4965	2413.1304	2208.0805	1828.2642	1469.1484	1300.2911 (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	76.3695	76.6013	76.8345	78.0221	78.2640	79.4966	79.4966	79.7478	78.9990	78.2640	77.7816	77.3051
alpha	6.0913	6.1068	6.1223	6.2015	6.2176	6.2998	6.2998	6.3165	6.2666	6.2176	6.1854	6.1537
util living area	0.9975	0.9875	0.9543	0.8447	0.6612	0.4643	0.3335	0.3745	0.6083	0.9111	0.9912	0.9984 (86)
Living	19.9917	20.2619	20.5630	20.8504	20.9707	20.9972	20.9997	20.9994	20.9865	20.7913	20.3293	19.9502
Non living	19.2953	19.5647	19.8582	20.1279	20.2245	20.2523	20.2534	20.2555	20.2424	20.0850	19.6419	19.2611
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10
MIT	20.4842	20.2619	20.5630	20.8504	20.9707	20.9972	20.9997	20.9994	20.9865	20.7913	20.3293	20.0970 (87)
Th 2	20.2252	20.2274	20.2296	20.2404	20.2426	20.2535	20.2535	20.2557	20.2491	20.2426	20.2382	20.2339 (88)
util rest of house	0.9967	0.9840	0.9427	0.8137	0.6138	0.4111	0.2771	0.3141	0.5468	0.8842	0.9882	0.9979 (89)
MIT 2	19.7495	19.5647	19.8582	20.1279	20.2245	20.2523	20.2534	20.2555	20.2424	20.0850	19.6419	19.3971 (90)
Living area fraction									FLA = Living area / (4) =			
MIT	19.9251	19.7314	20.0267	20.3006	20.4029	20.4304	20.4318	20.4334	20.4203	20.2539	19.8062	19.5645 (92)
Temperature adjustment												0.0000
adjusted MIT	19.9251	19.7314	20.0267	20.3006	20.4029	20.4304	20.4318	20.4334	20.4203	20.2539	19.8062	19.5645 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9964	0.9813	0.9392	0.8164	0.6241	0.4237	0.2906	0.3286	0.5611	0.8846	0.9861	0.9973 (94)
Useful gains	1397.0176	1799.2723	2047.7847	2060.6876	1703.8346	1147.4274	755.8718	792.8792	1239.0034	1617.3318	1448.6911	1296.7964 (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	3209.3905	3037.1372	2761.5524	2292.0726	1744.2892	1150.4438	756.0950	793.3522	1254.9723	1934.8978	2562.4649	3117.6460 (97)
Space heating kWh	1348.4054	831.8452	531.0432	166.5972	30.0982	0.0000	0.0000	0.0000	0.0000	236.2691	801.9172	1354.7121 (98a)
Space heating requirement - total per year (kWh/year)												5300.8876
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)												0.0000
Space heating kWh	1348.4054	831.8452	531.0432	166.5972	30.0982	0.0000	0.0000	0.0000	0.0000	236.2691	801.9172	1354.7121 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												5300.8876
Space heating per m2												(98c) / (4) =
												21.4863 (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)

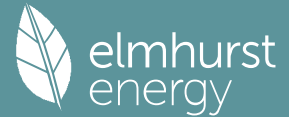
Efficiency of main space heating system 1 (in %) 313.7572 (206)

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

Efficiency of secondary/supplementary heating system, % 65.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	1348.4054	831.8452	531.0432	166.5972	30.0982	0.0000	0.0000	0.0000	0.0000	236.2691	801.9172	1354.7121 (98)
Space heating efficiency (main heating system 1)	313.7572	313.7572	313.7572	313.7572	313.7572	0.0000	0.0000	0.0000	0.0000	313.7572	313.7572	313.7572 (210)
Space heating fuel (main heating system)	429.7607	265.1238	169.2529	53.0975	9.5928	0.0000	0.0000	0.0000	0.0000	75.3032	255.5852	431.7708 (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	219.4714	193.9467	206.2500	182.4907	177.5512	160.7593	159.4905	165.5644	167.0441	185.3010	195.7690	217.2794 (64)
Efficiency of water heater (217)m	178.0713	178.0713	178.0713	178.0713	178.0713	178.0713	178.0713	178.0713	178.0713	178.0713	178.0713	178.0713 (216)
Fuel for water heating, kWh/month	123.2492	108.9152	115.8244	102.4818	99.7079	90.2781	89.5656	92.9765	93.8074	104.0600	109.9386	122.0182 (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	120.3692	108.7206	120.3692	116.4864	120.3692	116.4864	120.3692	120.3692	116.4864	120.3692	116.4864	120.3692 (231)
Lighting	55.8164	44.7780	40.3176	29.5384	22.8163	18.6411	20.8138	27.0546	35.1412	46.1072	52.0780	57.3677 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-79.9623	-148.9187	-287.9082	-418.5974	-529.3517	-523.3952	-513.0779	-439.1992	-323.2467	-199.1258	-97.9499	-64.6355 (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)

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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	-0.2611	-1.5749	-8.3014	-29.3002	-63.0675	-73.8016	-70.0847	-45.2269	-20.1415	-4.5183	-0.5876	-0.1604	(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													1689.4869 (211)
Space heating fuel - main system 2													0.0000 (213)
Space heating fuel - secondary													0.0000 (215)
Efficiency of water heater													178.0713
Water heating fuel used													1252.8229 (219)
Space cooling fuel													0.0000 (221)
Electricity for pumps and fans: (BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.7780) mechanical ventilation fans (SFP = 1.7780)													1417.2506 (230a)
Total electricity for the above, kWh/year													1417.2506 (231)
Electricity for lighting (calculated in Appendix L)													450.4704 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation													-3942.3947 (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													1326.5724 (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	1689.4869	0.1577	266.4389 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1252.8229	0.1407	176.3284 (264)
Energy for instantaneous electric shower(s)	458.9363	0.1391	63.8482 (264a)
Space and water heating			442.7673 (265)
Pumps, fans and electric keep-hot	1417.2506	0.1387	196.5901 (267)
Energy for lighting	450.4704	0.1443	65.0168 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-3625.3684	0.1300	-471.4372
PV Unit electricity exported	-317.0263	0.1131	-35.8687
Total			-507.3059 (269)
Total CO2, kg/year			260.9165 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.0600 (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	1689.4869	1.5838	2675.7292 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1252.8229	1.5204	1904.8114 (278)
Energy for instantaneous electric shower(s)	458.9363	1.5143	694.9829 (278a)
Space and water heating			4580.5406 (279)
Pumps, fans and electric keep-hot	1417.2506	1.5128	2144.0167 (281)
Energy for lighting	450.4704	1.5338	690.9465 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-3625.3684	1.4803	-5366.7588
PV Unit electricity exported	-317.0263	0.4144	-131.3878
Total			-5498.1466 (283)
Total Primary energy kWh/year			2612.3401 (286)
Dwelling Primary energy Rate (DPER)			10.5900 (287)

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

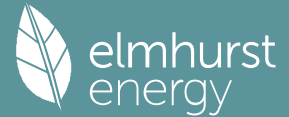
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Basement floor	83.9300 (1a)	x 2.5200 (2a)	= 211.5036 (1a) - (3a)
Ground floor	90.4700 (1b)	x 2.7500 (2b)	= 248.7925 (1b) - (3b)
First floor	72.3100 (1c)	x 2.6700 (2c)	= 193.0677 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	246.7100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	653.3638 (5)

2. Ventilation rate

m3 per hour

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Number of open chimneys 0 * 80 = 0.0000 (6a)
 Number of open flues 0 * 20 = 0.0000 (6b)
 Number of chimneys / flues attached to closed fire 0 * 10 = 0.0000 (6c)
 Number of flues attached to solid fuel boiler 0 * 20 = 0.0000 (6d)
 Number of 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) = 0.0612 (8)
 Pressure test Yes
 Pressure Test Method Blower Door
 Measured/design AP50 5.0000 (17)
 Infiltration rate 0.3112 (18)
 Number of sides sheltered 0 (19)
 Shelter factor (20) = 1 - [0.075 x (19)] = 1.0000 (20)
 Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.3112 (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 infltr rate												
Effective ac	0.3968	0.3890	0.3812	0.3423	0.3346	0.2957	0.2957	0.2879	0.3112	0.3346	0.3501	0.3657 (22b)
	0.5787	0.5757	0.5727	0.5586	0.5560	0.5437	0.5437	0.5414	0.5484	0.5560	0.5613	0.5669 (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
TER Semi-glazed door			3.7800	1.0000	3.7800		(26a)
TER Opening Type (Uw = 1.20)			43.4700	1.1450	49.7748		(27)
Lower Ground Floor			83.9300	0.1300	10.9109		(28a)
Ground Floor			7.6900	0.1300	0.9997		(28a)
Typical External Wall	317.3323	47.2500	270.0823	0.1800	48.6148		(29a)
LGF Exposed Roof	3.7100		3.7100	0.1100	0.4081		(30)
GF Exposed Roof (Living Room)	5.3900		5.3900	0.1100	0.5929		(30)
GF Exposed Roof (Kitchen)	5.0800		5.0800	0.1100	0.5588		(30)
GF Exposed Roof (Breakfast)	7.6900		7.6900	0.1100	0.8459		(30)
FF Main Roof	49.4500		49.4500	0.1100	5.4395		(30)
FF Parapet Roof	22.8600		22.8600	0.1100	2.5146		(30)
Total net area of external elements Aum(A, m2)			503.1323				(31)
Fabric heat loss, W/K = Sum (A x U)					124.4400		(32)
							(26)...(30) + (32) =

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 228.8937 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E1 Steel lintel with perforated steel base plate	31.3500	0.0500	1.5675
E3 Sill	29.5500	0.0500	1.4775
E4 Jamb	81.6800	0.0500	4.0840
E5 Ground floor (normal)	45.9890	0.1600	7.3582
E6 Intermediate floor within a dwelling	73.7030	0.0000	0.0000
E8 Balcony within a dwelling, wall insulation continuous	17.6590	0.0000	0.0000
E14 Flat roof	51.9530	0.0800	4.1562
E15 Flat roof with parapet	13.6590	0.5600	7.6490
E16 Corner (normal)	43.1900	0.0900	3.8871
E17 Corner (inverted - internal area greater than external area)	10.9300	-0.0900	-0.9837
E22 Basement floor	25.9780	0.0700	1.8185
E24 Eaves (insulation at ceiling level - inverted)	18.7760	0.2400	4.5062

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 35.5206 (36)

Point Thermal Bridges

Total fabric heat loss (33) + (36) + (36a) = 159.9606 (37)

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

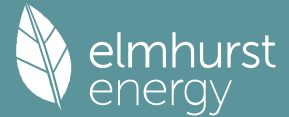
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	124.7796	124.1205	123.4744	120.4397	119.8719	117.2288	117.2288	116.7394	118.2469	119.8719	121.0205	122.2213 (38)
Average = Sum(39)m / 12 =	284.7402	284.0811	283.4350	280.4003	279.8326	277.1895	277.1895	276.7000	278.2075	279.8326	280.9812	282.1820 (39)
												280.3976

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1541	1.1515	1.1489	1.1366	1.1343	1.1235	1.1235	1.1216	1.1277	1.1343	1.1389	1.1438 (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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Hot water usage for mixer showers												3.0627 (42)
Hot water usage for baths	75.5705	74.4348	72.7799	69.6136	67.2769	64.6710	63.1898	64.8322	66.6326	69.4305	72.6648	75.2810 (42a)
Hot water usage for other uses	32.6210	32.1365	31.4543	30.1964	29.2545	28.2101	27.6459	28.3234	29.0610	30.1786	31.4624	32.5107 (42b)
Average daily hot water use (litres/day)	45.9946	44.3221	42.6496	40.9770	39.3045	37.6320	37.6320	39.3045	40.9770	42.6496	44.3221	45.9946 (42c)
Daily hot water use	154.1861	150.8935	146.8838	140.7870	135.8358	130.5130	128.4677	132.4601	136.6706	142.2586	148.4493	153.7863 (44)
Energy conte	244.1932	214.8703	225.7549	192.7303	182.8612	160.4810	155.3706	164.0132	168.5285	193.0436	211.4933	240.7922 (45)
Energy content (annual)												Total = Sum(45)m = 2354.1322
Distribution loss (46)m = 0.15 x (45)m	36.6290	32.2305	33.8632	28.9096	27.4292	24.0721	23.3056	24.6020	25.2793	28.9565	31.7240	36.1188 (46)
Water storage loss:												300.0000 (47)
Store volume												2.1127 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												1.1409 (55)
Enter (49) or (54) in (55)												
Total storage loss	35.3664	31.9439	35.3664	34.2256	35.3664	34.2256	35.3664	35.3664	34.2256	35.3664	34.2256	35.3664 (56)

Full SAP Calculation Printout



If cylinder contains dedicated solar storage												
Primary loss	35.3664	31.9439	35.3664	34.2256	35.3664	34.2256	35.3664	35.3664	34.2256	35.3664	34.2256	35.3664 (57)
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 (59)
Total heat required for water heating calculated for each month												
WWHRS	302.8220	267.8253	284.3837	249.4679	241.4900	217.2186	213.9994	222.6421	225.2661	251.6724	268.2308	299.4210 (62)
PV diverter	-34.5477	-30.5542	-31.9946	-26.4928	-24.6904	-21.1277	-19.8039	-21.0594	-21.8596	-25.7700	-29.1943	-33.9079 (63a)
Solar input	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
Output from w/h	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
	268.2743	237.2711	252.3891	222.9751	216.7996	196.0908	194.1955	201.5826	203.4065	225.9024	239.0366	265.5131 (64)
Total per year (kWh/year) = Sum(64)m =											2723.4366 (64)	
Electric shower(s)											2723 (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												
	128.0973	113.8084	121.9666	109.4729	107.7044	98.7500	98.5638	101.4375	101.4258	111.0900	115.7116	126.9665 (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	153.1326	153.1326	153.1326	153.1326	153.1326	153.1326	153.1326	153.1326	153.1326	153.1326	153.1326	153.1326 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	213.7757	236.6802	213.7757	220.9015	213.7757	220.9015	213.7757	213.7757	220.9015	213.7757	220.9015	213.7757 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	413.5222	417.8132	406.9999	383.9796	354.9205	327.6091	309.3634	305.0724	315.8857	338.9060	367.9651	395.2765 (68)
Pumps, fans	38.3133	38.3133	38.3133	38.3133	38.3133	38.3133	38.3133	38.3133	38.3133	38.3133	38.3133	38.3133 (69)
Losses e.g. evaporation (negative values) (Table 5)	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000 (70)
Water heating gains (Table 5)	-122.5061	-122.5061	-122.5061	-122.5061	-122.5061	-122.5061	-122.5061	-122.5061	-122.5061	-122.5061	-122.5061	-122.5061 (71)
Total internal gains	172.1738	169.3578	163.9335	152.0457	144.7640	137.1527	132.4782	136.3407	140.8691	149.3146	160.7105	170.6538 (72)
	871.4114	895.7910	856.6489	828.8665	785.3999	754.6032	724.5570	724.1285	746.5961	773.9361	821.5169	851.6458 (73)

6. Solar gains

[Jan]		Area m ²	Solar flux Table 6a W/m ²	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W					
Northeast		1.8700	11.2829	0.6300	0.7000	0.7700	6.4482 (75)					
Southeast		26.8300	36.7938	0.6300	0.7000	0.7700	301.6946 (77)					
Southwest		9.9900	36.7938	0.6300	0.7000	0.7700	112.3343 (79)					
Northwest		4.7800	11.2829	0.6300	0.7000	0.7700	16.4825 (81)					
Solar gains	436.9595	751.9203	1049.0413	1333.7235	1524.8333	1527.4212	1466.9312	1322.2733	1147.3039	836.4870	524.7638	373.0487 (83)
Total gains	1308.3709	1647.7113	1905.6902	2162.5900	2310.2332	2282.0244	2191.4883	2046.4017	1893.9000	1610.4230	1346.2807	1224.6945 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
tau	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
alpha	55.0896	55.2174	55.3433	55.9422	56.0557	56.5902	56.5902	56.6903	56.3831	56.0557	55.8266	55.5890
util living area	4.6726	4.6812	4.6896	4.7295	4.7370	4.7727	4.7727	4.7794	4.7589	4.7370	4.7218	4.7059
	0.9983	0.9946	0.9852	0.9534	0.8710	0.7095	0.5409	0.5960	0.8319	0.9720	0.9957	0.9987 (86)
MIT	19.3955	19.6340	19.9605	20.3786	20.7243	20.9275	20.9840	20.9751	20.8391	20.3719	19.8031	19.3603 (87)
Th 2	19.9569	19.9590	19.9611	19.9711	19.9730	19.9817	19.9817	19.9833	19.9783	19.9730	19.9692	19.9652 (88)
util rest of house	0.9977	0.9929	0.9803	0.9372	0.8266	0.6211	0.4234	0.4766	0.7607	0.9592	0.9941	0.9983 (89)
MIT 2	18.0748	18.3811	18.7976	19.3256	19.7299	19.9370	19.9760	19.9735	19.8615	19.3269	18.6055	18.0356 (90)
Living area fraction	18.3906	18.6806	19.0756	19.5774	19.9677	20.1738	20.2170	20.2130	20.0952	19.5767	18.8918	18.3523 (91)
MIT	18.3906	18.6806	19.0756	19.5774	19.9677	20.1738	20.2170	20.2130	20.0952	19.5767	18.8918	18.3523 (92)
Temperature adjustment												0.0000
adjusted MIT	18.3906	18.6806	19.0756	19.5774	19.9677	20.1738	20.2170	20.2130	20.0952	19.5767	18.8918	18.3523 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9964	0.9898	0.9746	0.9294	0.8263	0.6390	0.4515	0.5048	0.7701	0.9526	0.9915	0.9973 (94)
Ext temp.	1303.6702	1630.9806	1857.2615	2009.9811	1908.9189	1458.3206	989.4274	1033.0174	1458.4194	1534.1105	1334.8411	1221.4302 (95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Space heating kWh	4012.1478	3914.8123	3564.3616	2993.9390	2313.5631	1545.0030	1002.5930	1055.0434	1667.9170	2511.9754	3313.2715	3993.5206 (97)
Space heating requirement - total per year (kWh/year)	2015.1073	1534.7349	1270.0825	708.4497	301.0552	0.0000	0.0000	0.0000	0.0000	727.5315	1424.4699	2062.4353 (98a)
Solar heating kWh												10043.8664
Solar heating contribution - total per year (kWh/year)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Space heating kWh	2015.1073	1534.7349	1270.0825	708.4497	301.0552	0.0000	0.0000	0.0000	0.0000	727.5315	1424.4699	2062.4353 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												10043.8664
Space heating per m ²												40.7112 (99)

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

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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	2015.1073	1534.7349	1270.0825	708.4497	301.0552	0.0000	0.0000	0.0000	0.0000	727.5315	1424.4699	2062.4353	(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)	2183.2149	1662.7681	1376.0374	767.5511	326.1703	0.0000	0.0000	0.0000	0.0000	788.2248	1543.3044	2234.4911	(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	268.2743	237.2711	252.3891	222.9751	216.7996	196.0908	194.1955	201.5826	203.4065	225.9024	239.0366	265.5131	(64)
Efficiency of water heater	87.6387	87.4789	87.1702	86.4655	84.7963	79.8000	79.8000	79.8000	79.8000	86.4888	87.3838	87.6722	(216)
Fuel for water heating, kWh/month	306.1139	271.2322	289.5359	257.8775	255.6712	245.7279	243.3527	252.6098	254.8954	261.1925	273.5478	302.8474	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685	(231)
Lighting	44.4184	35.6341	32.0845	23.5065	18.1571	14.8345	16.5635	21.5299	27.9652	36.6918	41.4433	45.6529	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-75.5296	-104.9811	-148.7166	-164.5736	-175.0659	-162.3040	-160.0381	-152.0981	-137.9662	-118.5335	-82.3954	-65.4549	(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	-47.3604	-99.0565	-195.9328	-293.0152	-386.3708	-388.0529	-383.7349	-325.6131	-239.4322	-141.5384	-63.1691	-37.5172	(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													10881.7621 (211)
Space heating fuel - main system 2													0.0000 (213)
Space heating fuel - secondary													0.0000 (215)
Efficiency of water heater													79.8000
Water heating fuel used													3214.6041 (219)
Space cooling fuel													0.0000 (221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year													86.0000 (231)
Electricity for lighting (calculated in Appendix L)													358.4816 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation													-4148.4505 (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													10392.3973 (238)

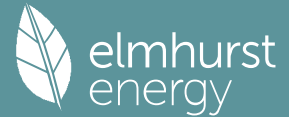
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	10881.7621	0.2100	2285.1700 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3214.6041	0.2100	675.0669 (264)
Space and water heating			2960.2369 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	358.4816	0.1443	51.7400 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1547.6570	0.1349	-208.8436
PV Unit electricity exported	-2600.7936	0.1260	-327.7203
Total			-536.5640 (269)
Total CO2, kg/year			2487.3422 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.0800 (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	10881.7621	1.1300	12296.3912 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3214.6041	1.1300	3632.5027 (278)
Space and water heating			15928.8939 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	358.4816	1.5338	549.8510 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1547.6570	1.4987	-2319.5390
PV Unit electricity exported	-2600.7936	0.4625	-1202.9687
Total			-3522.5076 (283)
Total Primary energy kWh/year			13086.3381 (286)
Target Primary Energy Rate (TPER)			53.0400 (287)

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Basement floor	83.9300 (1a)	x 2.5200 (2a)	= 211.5036 (1a) - (3a)
Ground floor	90.4700 (1b)	x 2.7500 (2b)	= 248.7925 (1b) - (3b)
First floor	72.3100 (1c)	x 2.6700 (2c)	= 193.0677 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	246.7100		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 653.3638 (5)

2. Ventilation rate

	Value	Reference
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of 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) =	0.0612 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	2.0000	(17)
Infiltration rate	0.1612	(18)
Number of sides sheltered	0	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1612 (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	0.2056	0.2015	0.1975	0.1773	0.1733	0.1532	0.1532	0.1491	0.1612	0.1733	0.1814	0.1894 (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	0.5211	0.5203	0.5195	0.5157	0.5150	0.5117	0.5117	0.5111	0.5130	0.5150	0.5164	0.5179 (25)

3. Heat losses and heat loss parameter

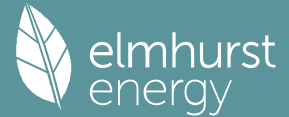
Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Typical Window (Uw = 1.00)			43.4700	0.9615	41.7981		(27)
Entrance Door			3.7800	1.0000	3.7800		(26a)
Lower Ground Floor			83.9300	0.1100	9.2323	110.0000	9232.3000 (28a)
Ground Floor			7.6900	0.1100	0.8459	110.0000	845.9000 (28a)
Typical External Wall	317.3323	47.2500	270.0823	0.1600	43.2132	110.0000	29709.0530 (29a)
LGF Exposed Roof	3.7100		3.7100	0.1300	0.4823	9.0000	33.3900 (30)
GF Exposed Roof (Living Room)	5.3900		5.3900	0.1300	0.7007	9.0000	48.5100 (30)
GF Exposed Roof (Kitchen)	5.0800		5.0800	0.1300	0.6604	9.0000	45.7200 (30)
GF Exposed Roof (Breakfast)	7.6900		7.6900	0.1300	0.9997	9.0000	69.2100 (30)
FF Main Roof	49.4500		49.4500	0.1200	5.9340	9.0000	445.0500 (30)
FF Parapet Roof	22.8600		22.8600	0.1300	2.9718	9.0000	205.7400 (30)
Total net area of external elements Aum(A, m ²)			503.1323				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	110.6183	(33)
LGF Blockwork			54.4100			75.0000	4080.7500 (32c)
LGF Studwork			92.0400			9.0000	828.3600 (32c)
GF Blockwork			51.6500			75.0000	3873.7500 (32c)
FF Blockwork			17.0900			75.0000	1281.7500 (32c)
GF Studwork			91.1800			9.0000	820.6200 (32c)
FF Studwork			87.2900			9.0000	785.6100 (32c)
GF Floor			82.7900			18.0000	1490.2200 (32d)
FF Floor			72.3100			18.0000	1301.5800 (32d)
LGF Internal Ceiling			80.2300			9.0000	722.0700 (32e)
GF Internal Ceiling			72.3100			9.0000	650.7900 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 56470.3730 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 228.8937 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E1 Steel lintel with perforated steel base plate	31.3500	0.0280	0.8778
E3 Sill	29.5500	0.0270	0.7979
E4 Jamb	81.6800	0.0210	1.7153
E5 Ground floor (normal)	45.9890	0.1610	7.4042
E6 Intermediate floor within a dwelling	73.7030	0.0020	0.1474
E8 Balcony within a dwelling, wall insulation continuous	17.6590	0.1000	1.7659
E14 Flat roof	51.9530	0.1600	8.3125
E15 Flat roof with parapet	13.6590	0.3000	4.0977
E16 Corner (normal)	43.1900	0.0480	2.0731
E17 Corner (inverted - internal area greater than external area)	10.9300	-0.0810	-0.8853
E22 Basement floor	25.9780	0.2200	5.7152
E24 Eaves (insulation at ceiling level - inverted)	18.7760	0.1500	2.8164
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			34.8380 (36)

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Point Thermal bridges													(36a) =	0.0000
Total fabric heat loss													(33) + (36) + (36a) =	145.4563 (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	112.3602	112.1833	112.0099	111.1956	111.0432	110.3339	110.3339	110.2026	110.6071	111.0432	111.3515	111.6737	(38)	
Average = Sum(39)m / 12 =	257.8166	257.6397	257.4663	256.6519	256.4996	255.7903	255.7903	255.6589	256.0635	256.4996	256.8078	257.1300	(39)	
	256.6512													
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
HLP (average)	1.0450	1.0443	1.0436	1.0403	1.0397	1.0368	1.0368	1.0363	1.0379	1.0397	1.0409	1.0422	(40)	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	(40)	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													3.0627 (42)	
Hot water usage for mixer showers													0.0000 (42a)	
Hot water usage for baths	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42b)	
Hot water usage for other uses	32.6210	32.1365	31.4543	30.1964	29.2545	28.2101	27.6459	28.3234	29.0610	30.1786	31.4624	32.5107	(42b)	
Average daily hot water use (litres/day)	45.9946	44.3221	42.6496	40.9770	39.3045	37.6320	37.6320	39.3045	40.9770	42.6496	44.3221	45.9946	(42c)	
	72.0581 (43)													
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Energy conte	78.6156	76.4586	74.1039	71.1734	68.5590	65.8420	65.2779	67.6279	70.0380	72.8281	75.7845	78.5054	(44)	
Energy content (annual)	124.5080	108.8761	113.8949	97.4329	92.2936	80.9604	78.9479	83.7374	86.3639	98.8271	107.9689	122.9204	(45)	
Distribution loss (46)m = 0.15 x (45)m													Total = Sum(45)m =	1196.7315
Water storage loss:													0.0000 (46)	
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	(46)	
If cylinder contains dedicated solar storage													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	105.8318	92.5447	96.8107	82.8179	78.4495	68.8164	67.1057	71.1768	73.4093	84.0030	91.7736	104.4824	(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	105.8318	92.5447	96.8107	82.8179	78.4495	68.8164	67.1057	71.1768	73.4093	84.0030	91.7736	104.4824	(64)	
	1017.2218 (64)													
12Total per year (kWh/year)													1017 (64)	
Electric shower(s)	60.5194	53.9233	58.8821	56.1905	57.2449	54.6061	56.4263	57.2449	56.1905	58.8821	57.7749	60.5194	(64a)	
	688.4044 (64a)													
Heat gains from water heating, kWh/month	41.5878	36.6170	38.9232	34.7521	33.9236	30.8556	30.8830	32.1054	32.4000	35.7213	37.3871	41.2504	(65)	

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

Metabolic gains (Table 5), Watts													(66)m	
(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	153.1326	153.1326	153.1326	153.1326	153.1326	153.1326	153.1326	153.1326	153.1326	153.1326	153.1326	153.1326	(66)	
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	208.6389	230.9931	208.6389	215.5935	208.6389	215.5935	208.6389	208.6389	215.5935	208.6389	215.5935	208.6389	(67)	
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	413.5222	417.8132	406.9999	383.9796	354.9205	327.6091	309.3634	305.0724	315.8857	338.9060	367.9651	395.2765	(68)	
Pumps, fans	38.3133	38.3133	38.3133	38.3133	38.3133	38.3133	38.3133	38.3133	38.3133	38.3133	38.3133	38.3133	(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)	-122.5061	-122.5061	-122.5061	-122.5061	-122.5061	-122.5061	-122.5061	-122.5061	-122.5061	-122.5061	-122.5061	-122.5061	(71)	
Total internal gains	55.8976	54.4896	52.3161	48.2668	45.5962	42.8550	41.5094	43.1525	44.9999	48.0125	51.9266	55.4441	(72)	
	746.9984	772.2357	736.8947	716.7797	678.0955	654.9975	628.4515	625.8035	645.4190	664.4972	704.4250	728.2993	(73)	

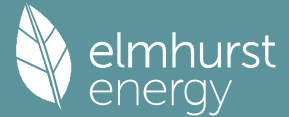
6. Solar gains

[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									
Northeast	1.8700	11.2829	0.5700	1.0000	0.7700	8.3344	(75)							
Southeast	26.8300	36.7938	0.5700	1.0000	0.7700	389.9454	(77)							
Southwest	9.9900	36.7938	0.5700	1.0000	0.7700	145.1940	(79)							
Northwest	4.7800	11.2829	0.5700	1.0000	0.7700	21.3039	(81)							
Solar gains	564.7776	971.8698	1355.9037	1723.8602	1970.8730	1974.2179	1896.0336	1709.0607	1482.9097	1081.1736	678.2662	482.1718	(83)	
Total gains	1311.7760	1744.1055	2092.7984	2440.6400	2648.9685	2629.2154	2524.4851	2334.8642	2128.3287	1745.6709	1382.6912	1210.4712	(84)	

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)	
Utilisation factor for gains for living area, nil,m (see Table 9a)														
tau	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
alpha	60.8425	60.8843	60.9253	61.1186	61.1549	61.3245	61.3245	61.3560	61.2591	61.1549	61.0815	61.0050	(85)	
util living area	5.0562	5.0590	5.0617	5.0746	5.0770	5.0883	5.0883	5.0904	5.0839	5.0770	5.0721	5.0670	(85)	

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	0.9983	0.9927	0.9758	0.9180	0.7888	0.6003	0.4417	0.4959	0.7494	0.9566	0.9950	0.9989 (86)
MIT	19.5759	19.8512	20.1960	20.5884	20.8592	20.9720	20.9951	20.9914	20.9182	20.5252	19.9564	19.5206 (87)
Th 2	20.0460	20.0466	20.0472	20.0499	20.0504	20.0528	20.0528	20.0532	20.0519	20.0504	20.0494	20.0483 (88)
util rest of house												
	0.9978	0.9905	0.9684	0.8941	0.7360	0.5204	0.3488	0.3977	0.6732	0.9388	0.9932	0.9985 (89)
MIT 2	18.7385	19.0127	19.3524	19.7266	19.9589	20.0401	20.0515	20.0507	20.0085	19.6768	19.1207	18.6851 (90)
Living area fraction									fLA = Living area / (4) =			0.2391 (91)
MIT	18.9387	19.2132	19.5541	19.9327	20.1741	20.2629	20.2771	20.2756	20.2259	19.8796	19.3204	18.8848 (92)
Temperature adjustment												0.0000
adjusted MIT	18.9387	19.2132	19.5541	19.9327	20.1741	20.2629	20.2771	20.2756	20.2259	19.8796	19.3204	18.8848 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9969	0.9879	0.9636	0.8907	0.7434	0.5387	0.3710	0.4212	0.6883	0.9349	0.9912	0.9979 (94)
Useful gains	1307.6781	1723.0656	2016.7022	2173.9307	1969.2857	1416.3415	936.6629	983.5237	1464.9982	1631.9747	1370.5027	1207.8883 (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	3774.1023	3687.6396	3360.9870	2831.5562	2173.6118	1448.5181	940.5552	990.8272	1568.6317	2380.2234	3138.3059	3775.9080 (97)
Space heating kWh	1835.0196	1320.1937	1000.1479	473.4904	152.0186	0.0000	0.0000	0.0000	0.0000	556.6971	1272.8183	1910.6066 (98a)
Space heating requirement - total per year (kWh/year)												8520.9922
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)												0.0000
Space heating kWh	1835.0196	1320.1937	1000.1479	473.4904	152.0186	0.0000	0.0000	0.0000	0.0000	556.6971	1272.8183	1910.6066 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												8520.9922
Space heating per m2												(98c) / (4) = 34.5385 (99)

8c. Space cooling requirement

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	2404.4286	1892.8480	1943.0078	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9107	0.9548	0.9344	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	2189.6799	1807.2142	1815.4588	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	2975.2980	2856.8059	2639.4190	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	565.6450	780.8962	613.0264	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction									fc = cooled area / (4) =			1.0000 (105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	141.4113	195.2241	153.2566	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												489.8919 (107)
Energy for space heating												34.5385 (99)
Energy for space cooling												1.9857 (108)
Total												36.5242 (109)
Fabric Energy Efficiency (DFEE)												36.5 (109)

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

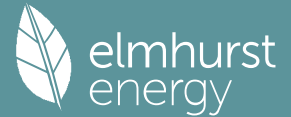
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Basement floor	83.9300 (1a)	x 2.5200 (2a)	= 211.5036 (1a) - (3a)
Ground floor	90.4700 (1b)	x 2.7500 (2b)	= 248.7925 (1b) - (3b)
First floor	72.3100 (1c)	x 2.6700 (2c)	= 193.0677 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	246.7100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	653.3638 (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)+(7a)+(7b)+(7c) =	40.0000 / (5) = 0.0612 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3112 (18)
Number of sides sheltered	0 (19)

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Shelter factor (20) = 1 - [0.075 x (19)] = 1.0000 (20)
 Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.3112 (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	0.3968	0.3890	0.3812	0.3423	0.3346	0.2957	0.2957	0.2879	0.3112	0.3346	0.3501	0.3657 (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	0.5787	0.5757	0.5727	0.5586	0.5560	0.5437	0.5437	0.5414	0.5484	0.5560	0.5613	0.5669 (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
TER Semi-glazed door			3.7800	1.0000	3.7800		(26a)
TER Opening Type (Uw = 1.20)			43.4700	1.1450	49.7748		(27)
Lower Ground Floor			83.9300	0.1300	10.9109		(28a)
Ground Floor			7.6900	0.1300	0.9997		(28b)
Typical External Wall	317.3323	47.2500	270.0823	0.1800	48.6148		(29a)
LGF Exposed Roof	3.7100		3.7100	0.1100	0.4081		(30)
GF Exposed Roof (Living Room)	5.3900		5.3900	0.1100	0.5929		(30)
GF Exposed Roof (Kitchen)	5.0800		5.0800	0.1100	0.5588		(30)
GF Exposed Roof (Breakfast)	7.6900		7.6900	0.1100	0.8459		(30)
FF Main Roof	49.4500		49.4500	0.1100	5.4395		(30)
FF Parapet Roof	22.8600		22.8600	0.1100	2.5146		(30)
Total net area of external elements Aum(A, m2)			503.1323				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	124.4400	(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 228.8937 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E1 Steel lintel with perforated steel base plate	31.3500	0.0500	1.5675
E3 Sill	29.5500	0.0500	1.4775
E4 Jamb	81.6800	0.0500	4.0840
E5 Ground floor (normal)	45.9890	0.1600	7.3582
E6 Intermediate floor within a dwelling	73.7030	0.0000	0.0000
E8 Balcony within a dwelling, wall insulation continuous	17.6590	0.0000	0.0000
E14 Flat roof	51.9530	0.0800	4.1562
E15 Flat roof with parapet	13.6590	0.5600	7.6490
E16 Corner (normal)	43.1900	0.0900	3.8871
E17 Corner (inverted - internal area greater than external area)	10.9300	-0.0900	-0.9837
E22 Basement floor	25.9780	0.0700	1.8185
E24 Eaves (insulation at ceiling level - inverted)	18.7760	0.2400	4.5062

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 35.5206 (36)

Point Thermal bridges

Total fabric heat loss (33) + (36) + (36a) = 159.9606 (37)

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

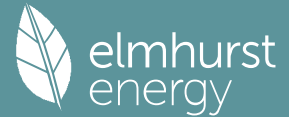
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	124.7796	124.1205	123.4744	120.4397	119.8719	117.2288	117.2288	116.7394	118.2469	119.8719	121.0205	122.2213 (38)
Average = Sum(39)m / 12 =	284.7402	284.0811	283.4350	280.4003	279.8326	277.1895	277.1895	276.7000	278.2075	279.8326	280.9812	282.1820 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1541	1.1515	1.1489	1.1366	1.1343	1.1235	1.1235	1.1216	1.1277	1.1343	1.1389	1.1438 (40)
HLP (average)												1.1365
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Assumed occupancy													3.0627 (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	32.6210	32.1365	31.4543	30.1964	29.2545	28.2101	27.6459	28.3234	29.0610	30.1786	31.4624	32.5107 (42b)	
Hot water usage for other uses	45.9946	44.3221	42.6496	40.9770	39.3045	37.6320	37.6320	39.3045	40.9770	42.6496	44.3221	45.9946 (42c)	
Average daily hot water use (litres/day)													72.0581 (43)
Daily hot water use	78.6156	76.4586	74.1039	71.1734	68.5590	65.8420	65.2779	67.6279	70.0380	72.8281	75.7845	78.5054 (44)	
Energy conte	124.5080	108.8761	113.8949	97.4329	92.2936	80.9604	78.9479	83.7374	86.3639	98.8271	107.9689	122.9204 (45)	
Energy content (annual)													Total = Sum(45)m = 1196.7315
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)	
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)	
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)	
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)	
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)	
Total heat required for water heating calculated for each month	105.8318	92.5447	96.8107	82.8179	78.4495	68.8164	67.1057	71.1768	73.4093	84.0030	91.7736	104.4824 (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	105.8318	92.5447	96.8107	82.8179	78.4495	68.8164	67.1057	71.1768	73.4093	84.0030	91.7736	104.4824 (64)	
12Total per year (kWh/year)													Total per year (kWh/year) = Sum(64)m = 1017.2218 (64)
Electric shower(s)	60.5194	53.9233	58.8821	56.1905	57.2449	54.6061	56.4263	57.2449	56.1905	58.8821	57.7749	60.5194 (64a)	
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =													688.4044 (64a)
Heat gains from water heating, kWh/month	41.5878	36.6170	38.9232	34.7521	33.9236	30.8556	30.8830	32.1054	32.4000	35.7213	37.3871	41.2504 (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	153.1326	153.1326	153.1326	153.1326	153.1326	153.1326	153.1326	153.1326	153.1326	153.1326	153.1326	153.1326 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	213.7757	236.6802	213.7757	220.9015	213.7757	220.9015	213.7757	213.7757	220.9015	213.7757	220.9015	213.7757 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	413.5222	417.8132	406.9999	383.9796	354.9205	327.6091	309.3634	305.0724	315.8857	338.9060	367.9651	395.2765 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	38.3133	38.3133	38.3133	38.3133	38.3133	38.3133	38.3133	38.3133	38.3133	38.3133	38.3133	38.3133 (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)	-122.5061	-122.5061	-122.5061	-122.5061	-122.5061	-122.5061	-122.5061	-122.5061	-122.5061	-122.5061	-122.5061	-122.5061 (71)
Water heating gains (Table 5)	55.8976	54.4896	52.3161	48.2668	45.5962	42.8550	41.5094	43.1525	44.9999	48.0125	51.9266	55.4441 (72)
Total internal gains	752.1352	777.9228	742.0315	722.0877	683.2322	660.3054	633.5883	630.9403	650.7269	669.6340	709.7329	733.4361 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	FF	Access factor Table 6d	Gains W					
Northeast	1.8700	11.2829	0.6300	0.7000	0.7000	0.7700	6.4482 (75)					
Southeast	26.8300	36.7938	0.6300	0.7000	0.7000	0.7700	301.6946 (77)					
Southwest	9.9900	36.7938	0.6300	0.7000	0.7000	0.7700	112.3343 (79)					
Northwest	4.7800	11.2829	0.6300	0.7000	0.7000	0.7700	16.4825 (81)					
Solar gains	436.9595	751.9203	1049.0413	1333.7235	1524.8333	1527.4212	1466.9312	1322.2733	1147.3039	836.4870	524.7638	373.0487 (83)
Total gains	1189.0947	1529.8431	1791.0728	2055.8111	2208.0655	2187.7267	2100.5195	1953.2135	1798.0308	1506.1209	1234.4968	1106.4848 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation factor for gains for living area, nil,m (see Table 9a)	55.0896	55.2174	55.3433	55.9422	56.0557	56.5902	56.5902	56.6903	56.3831	56.0557	55.8266	55.5890
tau	4.6726	4.6812	4.6896	4.7295	4.7370	4.7727	4.7727	4.7794	4.7589	4.7370	4.7218	4.7059
util living area	0.9988	0.9960	0.9884	0.9609	0.8860	0.7305	0.5616	0.6196	0.8522	0.9782	0.9970	0.9992 (86)
MIT	19.3404	19.5804	19.9105	20.3384	20.6983	20.9177	20.9813	20.9707	20.8189	20.3289	19.7520	19.3055 (87)
Th 2	19.9569	19.9590	19.9611	19.9711	19.9730	19.9817	19.9817	19.9833	19.9783	19.9730	19.9692	19.9652 (88)
util rest of house	0.9985	0.9948	0.9845	0.9469	0.8446	0.6427	0.4409	0.4976	0.7850	0.9679	0.9959	0.9989 (89)
MIT 2	18.4352	18.6762	19.0055	19.4307	19.7628	19.9415	19.9764	19.9741	19.8736	19.4289	18.8556	18.4067 (90)
Living area fraction	18.6516	18.8924	19.2219	19.6477	19.9864	20.1749	20.2167	20.2124	20.0996	19.6440	19.0699	18.6216 (92)
Temperature adjustment	18.6516	18.8924	19.2219	19.6477	19.9864	20.1749	20.2167	20.2124	20.0996	19.6440	19.0699	18.6216 (93)
adjusted MIT	18.6516	18.8924	19.2219	19.6477	19.9864	20.1749	20.2167	20.2124	20.0996	19.6440	19.0699	18.6216 (93)

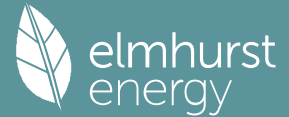
8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	1186.4577	1519.0208	1756.5589	1935.2967	1866.4000	1445.5469	986.9324	1028.6012	1428.1037	1451.1469	1227.5946	1104.7280 (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	4086.4892	3974.9640	3605.8269	3013.6508	2318.8134	1545.3079	1002.5029	1054.8876	1669.1296	2530.8131	3363.3178	4069.5185 (97)
Space heating kWh	2157.6235	1650.3938	1375.8554	776.4149	336.5955	0.0000	0.0000	0.0000	0.0000	803.2717	1537.7206	2205.8041 (98a)
Space heating requirement - total per year (kWh/year)												10843.6796
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)												0.0000
Space heating kWh	2157.6235	1650.3938	1375.8554	776.4149	336.5955	0.0000	0.0000	0.0000	0.0000	803.2717	1537.7206	2205.8041 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												10843.6796
Space heating per m2										(98c) / (4) =		43.9531 (99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	2605.5810	2051.2020	2102.9200	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8010	0.8787	0.8429	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	2087.0982	1802.3065	1772.6420	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	2453.5175	2355.7433	2187.9611	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	263.8219	411.7570	308.9974	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction									fc = cooled area / (4) =			1.0000 (105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	65.9555	102.9393	77.2493	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												246.1441 (107)
Energy for space heating												43.9531 (99)
Energy for space cooling												0.9977 (108)
Total												44.9508 (109)
Fabric Energy Efficiency (TFEE)												45.0 (109)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Basement floor	83.9300 (1a)	x 2.5200 (2a)	= 211.5036 (1a) - (3a)
Ground floor	90.4700 (1b)	x 2.7500 (2b)	= 248.7925 (1b) - (3b)
First floor	72.3100 (1c)	x 2.6700 (2c)	= 193.0677 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	246.7100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 653.3638 (5)

2. Ventilation rate

	Value	Reference
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	1 * 10 =	10.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Value	Reference
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	10.0000 / (5) = 0.0153 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	2.0000	(17)
Infiltration rate	0.1153	(18)
Number of sides sheltered	0	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1153 (21)

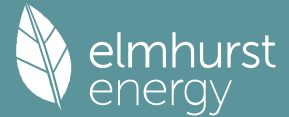
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750
Adj infilt rate	0.1470	0.1441	0.1412	0.1268	0.1240	0.1095	0.1095	0.1067	0.1153	0.1240	0.1297	0.1355
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												73.8000 (23c)
Effective ac	0.2780	0.2751	0.2722	0.2578	0.2550	0.2405	0.2405	0.2377	0.2463	0.2550	0.2607	0.2665 (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
Typical Window (Uw = 1.00)			43.4700	0.9615	41.7981		(27)
Entrance Door			3.7800	1.0000	3.7800		(26a)
Lower Ground Floor			83.9300	0.1100	9.2323	110.0000	9232.3000 (28a)
Ground Floor			7.6900	0.1100	0.8459	110.0000	845.9000 (28a)
Typical External Wall	317.3323	47.2500	270.0823	0.1600	43.2132	110.0000	29709.0530 (29a)
LGF Exposed Roof	3.7100		3.7100	0.1300	0.4823	9.0000	33.3900 (30)
GF Exposed Roof (Living Room)	5.3900		5.3900	0.1300	0.7007	9.0000	48.5100 (30)
GF Exposed Roof (Kitchen)	5.0800		5.0800	0.1300	0.6604	9.0000	45.7200 (30)
GF Exposed Roof (Breakfast)	7.6900		7.6900	0.1300	0.9997	9.0000	69.2100 (30)
FF Main Roof	49.4500		49.4500	0.1200	5.9340	9.0000	445.0500 (30)
FF Parapet Roof	22.8600		22.8600	0.1300	2.9718	9.0000	205.7400 (30)
Total net area of external elements Aum(A, m2)			503.1323				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	110.6183	(33)
LGF Blockwork			54.4100			75.0000	4080.7500 (32c)
LGF Studwork			92.0400			9.0000	828.3600 (32c)
GF Blockwork			51.6500			75.0000	3873.7500 (32c)
FF Blockwork			17.0900			75.0000	1281.7500 (32c)
GF Studwork			91.1800			9.0000	820.6200 (32c)
FF Studwork			87.2900			9.0000	785.6100 (32c)
GF Floor			82.7900			18.0000	1490.2200 (32d)
FF Floor			72.3100			18.0000	1301.5800 (32d)
LGF Internal Ceiling			80.2300			9.0000	722.0700 (32e)
GF Internal Ceiling			72.3100			9.0000	650.7900 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	56470.3730 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							228.8937 (35)

List of Thermal Bridges	Length	Psi-value	Total
K1 Element	31.3500	0.0280	0.8778
E1 Steel lintel with perforated steel base plate	29.5500	0.0270	0.7979
E3 Sill	81.6800	0.0210	1.7153
E4 Jamb	45.9890	0.1610	7.4042
E5 Ground floor (normal)	73.7030	0.0020	0.1474
E6 Intermediate floor within a dwelling	17.6590	0.1000	1.7659
E8 Balcony within a dwelling, wall insulation continuous	51.9530	0.1600	8.3125
E14 Flat roof	13.6590	0.3000	4.0977
E15 Flat roof with parapet	43.1900	0.0480	2.0731
E16 Corner (normal)			

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E17 Corner (inverted - internal area greater than external area)	10.9300	-0.0810	-0.8853	
E22 Basement floor	25.9780	0.2200	5.7152	
E24 Eaves (insulation at ceiling level - inverted)	18.7760	0.1500	2.8164	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				34.8380 (36)
Point Thermal bridges				(36a) = 0.0000
Total fabric heat loss				(33) + (36) + (36a) = 145.4563 (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	59.9427	59.3212	58.6996	55.5920	54.9705	51.8629	51.8629	51.2413	53.1059	54.9705	56.2135	57.4566 (38)
Heat transfer coeff	205.3990	204.7775	204.1560	201.0484	200.4268	197.3192	197.3192	196.6977	198.5623	200.4268	201.6699	202.9129 (39)
Average = Sum(39)m / 12 =												200.8930

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.8326	0.8300	0.8275	0.8149	0.8124	0.7998	0.7998	0.7973	0.8048	0.8124	0.8174	0.8225 (40)
HLP (average)												0.8143
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy													3.0627 (42)
Hot water usage for mixer showers	25.1902	24.8116	24.2600	23.2045	22.4256	21.5570	21.0633	21.6107	22.2109	23.1435	24.2216	25.0937 (42a)	
Hot water usage for baths	32.6210	32.1365	31.4543	30.1964	29.2545	28.2101	27.6459	28.3234	29.0610	30.1786	31.4624	32.5107 (42b)	
Hot water usage for other uses	45.9946	44.3221	42.6496	40.9770	39.3045	37.6320	37.6320	39.3045	40.9770	42.6496	44.3221	45.9946 (42c)	
Average daily hot water use (litres/day)													95.2826 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	103.8058	101.2702	98.3638	94.3779	90.9846	87.3990	86.3412	89.2386	92.2489	95.9716	100.0061	103.5990 (44)
Energy conte	164.4030	144.2075	151.1816	129.1987	122.4828	107.4673	104.4221	110.4960	113.7521	130.2326	142.4770	162.2110 (45)
Energy content (annual)												Total = Sum(45)m = 1582.5317
Distribution loss (46)m = 0.15 x (45)m	24.6605	21.6311	22.6772	19.3798	18.3724	16.1201	15.6633	16.5744	17.0628	19.5349	21.3716	24.3317 (46)
Water storage loss:												300.0000 (47)
Store volume												1.9000 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												1.0260 (55)
Enter (49) or (54) in (55)												
Total storage loss	31.8060	28.7280	31.8060	30.7800	31.8060	30.7800	31.8060	31.8060	30.7800	31.8060	30.7800	31.8060 (56)
If cylinder contains dedicated solar storage	31.8060	28.7280	31.8060	30.7800	31.8060	30.7800	31.8060	31.8060	30.7800	31.8060	30.7800	31.8060 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	219.4714	193.9467	206.2500	182.4907	177.5512	160.7593	159.4905	165.5644	167.0441	185.3010	195.7690	217.2794 (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	219.4714	193.9467	206.2500	182.4907	177.5512	160.7593	159.4905	165.5644	167.0441	185.3010	195.7690	217.2794 (64)
Electric shower(s)	40.3463	35.9488	39.2548	37.4603	38.1633	36.4041	37.6175	38.1633	37.4603	39.2548	38.5166	40.3463 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												458.9363 (64a)
Heat gains from water heating, kWh/month	108.8053	96.7276	104.1363	94.9572	94.3211	87.4675	88.1795	90.3355	89.8213	97.1707	99.6364	108.0764 (65)

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

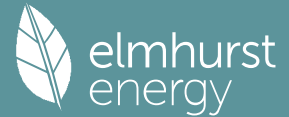
Metabolic gains (Table 5), Watts													
(66)m	183.7592	183.7592	183.7592	183.7592	183.7592	183.7592	183.7592	183.7592	183.7592	183.7592	183.7592	183.7592 (66)	
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	63.7687	56.6388	46.0618	34.8717	26.0670	22.0069	23.7792	30.9091	41.4862	52.6762	61.4809	65.5411 (67)	
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	617.1973	623.6019	607.4625	573.1038	529.7321	488.9688	461.7364	455.3319	471.4712	505.8299	549.2016	589.9649 (68)	
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	56.4386	56.4386	56.4386	56.4386	56.4386	56.4386	56.4386	56.4386	56.4386	56.4386	56.4386	56.4386 (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)	-122.5061	-122.5061	-122.5061	-122.5061	-122.5061	-122.5061	-122.5061	-122.5061	-122.5061	-122.5061	-122.5061	-122.5061 (71)	
Water heating gains (Table 5)	146.2437	143.9398	139.9681	131.8851	126.7756	121.4826	118.5208	121.4186	124.7517	130.6058	138.3838	145.2640 (72)	
Total internal gains	944.9013	941.8721	911.1841	857.5523	800.2664	750.1500	721.7281	725.3513	755.4007	806.8036	866.7580	918.4616 (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	1.8700	11.2829	0.5700	1.0000	0.7700	8.3344 (75)						
Southeast	26.8300	36.7938	0.5700	1.0000	0.7700	389.9454 (77)						
Southwest	9.9900	36.7938	0.5700	1.0000	0.7700	145.1940 (79)						
Northwest	4.7800	11.2829	0.5700	1.0000	0.7700	21.3039 (81)						
Solar gains	564.7776	971.8698	1355.9037	1723.8602	1970.8730	1974.2179	1896.0336	1709.0607	1482.9097	1081.1736	678.2662	482.1718 (83)
Total gains	1509.6789	1913.7419	2267.0878	2581.4125	2771.1394	2724.3679	2617.7616	2434.4120	2238.3105	1887.9772	1545.0242	1400.6335 (84)

7. Mean internal temperature (heating season)

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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	76.3695	76.6013	76.8345	78.0221	78.2640	79.4966	79.4966	79.7478	78.9990	78.2640	77.7816	77.3051
alpha	6.0913	6.1068	6.1223	6.2015	6.2176	6.2998	6.2998	6.3165	6.2666	6.2176	6.1854	6.1537
util living area	0.9962	0.9845	0.9462	0.8343	0.6528	0.4616	0.3314	0.3712	0.6008	0.9002	0.9886	0.9975 (86)
Living	20.0440	20.2984	20.5950	20.8610	20.9726	20.9973	20.9997	20.9995	20.9874	20.8082	20.3648	19.9994
Non living	19.3474	19.6004	19.8879	20.1365	20.2257	20.2523	20.2534	20.2555	20.2429	20.0992	19.6766	19.3101
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10
MIT	20.5109	20.2984	20.5950	20.8610	20.9726	20.9973	20.9997	20.9995	20.9874	20.8082	20.3648	20.1394 (87)
Th 2	20.2252	20.2274	20.2296	20.2404	20.2426	20.2535	20.2535	20.2557	20.2491	20.2426	20.2382	20.2339 (88)
util rest of house	0.9951	0.9804	0.9331	0.8024	0.6056	0.4086	0.2753	0.3114	0.5399	0.8713	0.9849	0.9968 (89)
MIT 2	19.7761	19.6004	19.8879	20.1365	20.2257	20.2523	20.2534	20.2555	20.2429	20.0992	19.6766	19.4393 (90)
Living area fraction									FLA = Living area / (4) =			0.2391 (91)
MIT	19.9518	19.7673	20.0570	20.3097	20.4043	20.4304	20.4318	20.4334	20.4208	20.2687	19.8411	19.6067 (92)
Temperature adjustment												0.0000
adjusted MIT	19.9518	19.7673	20.0570	20.3097	20.4043	20.4304	20.4318	20.4334	20.4208	20.2687	19.8411	19.6067 (93)

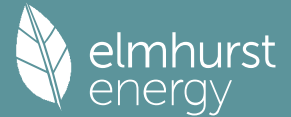
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9947	0.9774	0.9297	0.8055	0.6159	0.4212	0.2888	0.3257	0.5541	0.8724	0.9824	0.9960 (94)
Useful gains	1501.6270	1870.4155	2107.7385	2079.4274	1706.8557	1147.5383	755.8807	792.9055	1240.1724	1647.1221	1517.8275	1395.0887 (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	3214.8642	3044.4908	2767.7360	2293.9096	1744.5731	1150.4542	756.0959	793.3549	1255.0821	1937.8741	2569.5057	3126.2161 (97)
Space heating kWh	1274.6485	788.9786	491.0382	154.4272	28.0617	0.0000	0.0000	0.0000	0.0000	216.3194	757.2083	1287.9588 (98a)
Space heating requirement - total per year (kWh/year)												4998.6408
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)												0.0000
Space heating kWh	1274.6485	788.9786	491.0382	154.4272	28.0617	0.0000	0.0000	0.0000	0.0000	216.3194	757.2083	1287.9588 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4998.6408
Space heating per m2										(98c) / (4) =		20.2612 (99)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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 %)												313.7572 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												65.0000 (208)
Space heating requirement	1274.6485	788.9786	491.0382	154.4272	28.0617	0.0000	0.0000	0.0000	0.0000	216.3194	757.2083	1287.9588 (98)
Space heating efficiency (main heating system 1)	313.7572	313.7572	313.7572	313.7572	313.7572	0.0000	0.0000	0.0000	0.0000	313.7572	313.7572	313.7572 (210)
Space heating fuel (main heating system)	406.2531	251.4615	156.5026	49.2187	8.9438	0.0000	0.0000	0.0000	0.0000	68.9448	241.3357	410.4953 (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	219.4714	193.9467	206.2500	182.4907	177.5512	160.7593	159.4905	165.5644	167.0441	185.3010	195.7690	217.2794 (64)
Efficiency of water heater												178.0713 (216)
(217)m	178.0713	178.0713	178.0713	178.0713	178.0713	178.0713	178.0713	178.0713	178.0713	178.0713	178.0713	178.0713 (217)
Fuel for water heating, kWh/month	123.2492	108.9152	115.8244	102.4818	99.7079	90.2781	89.5656	92.9765	93.8074	104.0600	109.9386	122.0182 (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	120.3692	108.7206	120.3692	116.4864	120.3692	116.4864	120.3692	120.3692	116.4864	120.3692	116.4864	120.3692 (231)
Lighting	55.8164	44.7780	40.3176	29.5384	22.8163	18.6411	20.8138	27.0546	35.1412	46.1072	52.0780	57.3677 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-79.9554	-148.8888	-287.7555	-418.3998	-529.2759	-523.3952	-513.0779	-439.1992	-323.2467	-199.0752	-97.9380	-64.6316 (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)	-0.2680	-1.6048	-8.4541	-29.4978	-63.1433	-73.8016	-70.0847	-45.2269	-20.1415	-4.5689	-0.5994	-0.1643 (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												1593.1555 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												178.0713
Water heating fuel used												1252.8229 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.7780)												
mechanical ventilation fans (SFP = 1.7780)												1417.2506 (230a)
Total electricity for the above, kWh/year												1417.2506 (231)
Electricity for lighting (calculated in Appendix L)												450.4704 (232)

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

PV generation			-3942.3947 (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			1230.2410 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1593.1555	16.4900	262.7113 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1252.8229	16.4900	206.5905 (247)
Energy for instantaneous electric shower(s)	458.9363	16.4900	75.6786 (247a)
Pumps, fans and electric keep-hot	1417.2506	16.4900	233.7046 (249)
Energy for lighting	450.4704	16.4900	74.2826 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-3624.8392	16.4900	-597.7360
PV Unit electricity exported	-317.5555	5.5900	-17.7514
Total			-615.4873 (252)
Total energy cost			237.4803 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	0.2931 (257)
SAP value		95.2493
SAP rating (Section 12)		95 (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	1593.1555	0.1578	251.3458 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1252.8229	0.1407	176.3284 (264)
Energy for instantaneous electric shower(s)	458.9363	0.1391	63.8482 (264a)
Space and water heating			427.6742 (265)
Pumps, fans and electric keep-hot	1417.2506	0.1387	196.5901 (267)
Energy for lighting	450.4704	0.1443	65.0168 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-3624.8392	0.1300	-471.3604
PV Unit electricity exported	-317.5555	0.1132	-35.9522
Total			-507.3126 (269)
Total CO2, kg/year			245.8167 (272)
CO2 emissions per m2			1.0000 (273)
EI value			98.8708
EI rating			99 (274)
EI band			A

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

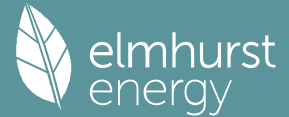
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Basement floor	83.9300 (1a)	x 2.5200 (2a)	= 211.5036 (1a) - (3a)
Ground floor	90.4700 (1b)	x 2.7500 (2b)	= 248.7925 (1b) - (3b)
First floor	72.3100 (1c)	x 2.6700 (2c)	= 193.0677 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	246.7100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	653.3638 (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	1 * 10 = 10.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)

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Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =											Air changes per hour	10.0000 / (5) =	0.0153 (8)
Pressure test												Yes		
Pressure Test Method												Blower Door		
Measured/design AP50													2.0000 (17)	
Infiltration rate													0.1153 (18)	
Number of sides sheltered													0 (19)	
Shelter factor	(20) = 1 - [0.075 x (19)] =											1.0000 (20)		
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =											0.1153 (21)		

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	6.3000	5.9000	5.8000	5.2000	5.2000	4.6000	4.7000	4.6000	4.9000	5.7000	5.8000	6.3000 (22)
Wind factor	1.5750	1.4750	1.4500	1.3000	1.3000	1.1500	1.1750	1.1500	1.2250	1.4250	1.4500	1.5750 (22a)
Adj infilt rate	0.1816	0.1701	0.1672	0.1499	0.1499	0.1326	0.1355	0.1326	0.1412	0.1643	0.1672	0.1816 (22b)

Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												73.8000 (23c)

Effective ac	0.3126	0.3011	0.2982	0.2809	0.2809	0.2636	0.2665	0.2636	0.2722	0.2953	0.2982	0.3126 (25)
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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Typical Window (Uw = 1.00)			43.4700	0.9615	41.7981		(27)
Entrance Door			3.7800	1.0000	3.7800		(26a)
Lower Ground Floor			83.9300	0.1100	9.2323	110.0000	9232.3000 (28a)
Ground Floor			7.6900	0.1100	0.8459	110.0000	845.9000 (28a)
Typical External Wall	317.3323	47.2500	270.0823	0.1600	43.2132	110.0000	29709.0530 (29a)
LGF Exposed Roof	3.7100		3.7100	0.1300	0.4823	9.0000	33.3900 (30)
GF Exposed Roof (Living Room)	5.3900		5.3900	0.1300	0.7007	9.0000	48.5100 (30)
GF Exposed Roof (Kitchen)	5.0800		5.0800	0.1300	0.6604	9.0000	45.7200 (30)
GF Exposed Roof (Breakfast)	7.6900		7.6900	0.1300	0.9997	9.0000	69.2100 (30)
FF Main Roof	49.4500		49.4500	0.1200	5.9340	9.0000	445.0500 (30)
FF Parapet Roof	22.8600		22.8600	0.1300	2.9718	9.0000	205.7400 (30)
Total net area of external elements Aum(A, m2)			503.1323				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	110.6183	(33)
LGF Blockwork			54.4100			75.0000	4080.7500 (32c)
LGF Studwork			92.0400			9.0000	828.3600 (32c)
GF Blockwork			51.6500			75.0000	3873.7500 (32c)
FF Blockwork			17.0900			75.0000	1281.7500 (32c)
GF Studwork			91.1800			9.0000	820.6200 (32c)
FF Studwork			87.2900			9.0000	785.6100 (32c)
GF Floor			82.7900			18.0000	1490.2200 (32d)
FF Floor			72.3100			18.0000	1301.5800 (32d)
LGF Internal Ceiling			80.2300			9.0000	722.0700 (32e)
GF Internal Ceiling			72.3100			9.0000	650.7900 (32e)

Heat capacity Cm = Sum(A x k)												(28)...(30) + (32) + (32a)...(32e) =	56470.3730 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K													228.8937 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E1 Steel lintel with perforated steel base plate	31.3500	0.0280	0.8778
E3 Sill	29.5500	0.0270	0.7979
E4 Jamb	81.6800	0.0210	1.7153
E5 Ground floor (normal)	45.9890	0.1610	7.4042
E6 Intermediate floor within a dwelling	73.7030	0.0020	0.1474
E8 Balcony within a dwelling, wall insulation continuous	17.6590	0.1000	1.7659
E14 Flat roof	51.9530	0.1600	8.3125
E15 Flat roof with parapet	13.6590	0.3000	4.0977
E16 Corner (normal)	43.1900	0.0480	2.0731
E17 Corner (inverted - internal area greater than external area)	10.9300	-0.0810	-0.8853
E22 Basement floor	25.9780	0.2200	5.7152
E24 Eaves (insulation at ceiling level - inverted)	18.7760	0.1500	2.8164

Thermal bridges (Sum(L x Psi) calculated using Appendix K)												34.8380 (36)
Point Thermal bridges												(36a) = 0.0000
Total fabric heat loss												(33) + (36) + (36a) = 145.4563 (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	67.4010	64.9149	64.2934	60.5642	60.5642	56.8351	57.4566	56.8351	58.6996	63.6718	64.2934	67.4010 (38)
Average = Sum(39)m / 12 =	212.8573	210.3712	209.7497	206.0206	206.0206	202.2914	202.9129	202.2914	204.1560	209.1282	209.7497	212.8573 (39)
												207.3672

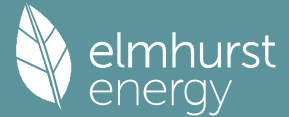
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.8628	0.8527	0.8502	0.8351	0.8351	0.8200	0.8225	0.8200	0.8275	0.8477	0.8502	0.8628 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												3.0627 (42)
Hot water usage for mixer showers												25.1902
Hot water usage for baths	25.1902	24.8116	24.2600	23.2045	22.4256	21.5570	21.0633	21.6107	22.2109	23.1435	24.2216	25.0937 (42a)
Hot water usage for other uses	32.6210	32.1365	31.4543	30.1964	29.2545	28.2101	27.6459	28.3234	29.0610	30.1786	31.4624	32.5107 (42b)
Average daily hot water use (litres/day)	45.9946	44.3221	42.6496	40.9770	39.3045	37.6320	37.6320	39.3045	40.9770	42.6496	44.3221	45.9946 (42c)
												95.2826 (43)

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	103.8058	101.2702	98.3638	94.3779	90.9846	87.3990	86.3412	89.2386	92.2489	95.9716	100.0061	103.5990 (44)
Energy content (annual)	164.4030	144.2075	151.1816	129.1987	122.4828	107.4673	104.4221	110.4960	113.7521	130.2326	142.4770	162.2110 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 1582.5317
Water storage loss:	24.6605	21.6311	22.6772	19.3798	18.3724	16.1201	15.6633	16.5744	17.0628	19.5349	21.3716	24.3317 (46)
Store volume												300.0000 (47)

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a) If manufacturer declared loss factor is known (kWh/day):												1.9000 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												1.0260 (55)
Total storage loss	31.8060	28.7280	31.8060	30.7800	31.8060	30.7800	31.8060	31.8060	30.7800	31.8060	30.7800	31.8060 (56)
If cylinder contains dedicated solar storage	31.8060	28.7280	31.8060	30.7800	31.8060	30.7800	31.8060	31.8060	30.7800	31.8060	30.7800	31.8060 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	219.4714	193.9467	206.2500	182.4907	177.5512	160.7593	159.4905	165.5644	167.0441	185.3010	195.7690	217.2794 (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	219.4714	193.9467	206.2500	182.4907	177.5512	160.7593	159.4905	165.5644	167.0441	185.3010	195.7690	217.2794 (64)
												Total per year (kWh/year) = Sum(64)m = 2230.9177 (64)
Electric shower(s)	40.3463	35.9488	39.2548	37.4603	38.1633	36.4041	37.6175	38.1633	37.4603	39.2548	38.5166	40.3463 (64a)
												Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 458.9363 (64a)
Heat gains from water heating, kWh/month	108.8053	96.7276	104.1363	94.9572	94.3211	87.4675	88.1795	90.3355	89.8213	97.1707	99.6364	108.0764 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	183.7592	183.7592	183.7592	183.7592	183.7592	183.7592	183.7592	183.7592	183.7592	183.7592	183.7592	183.7592 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	63.7687	56.6388	46.0618	34.8717	26.0670	22.0069	23.7792	30.9091	41.4862	52.6762	61.4809	65.5411 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	617.1973	623.6019	607.4625	573.1038	529.7321	488.9688	461.7364	455.3319	471.4712	505.8299	549.2016	589.9649 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	56.4386	56.4386	56.4386	56.4386	56.4386	56.4386	56.4386	56.4386	56.4386	56.4386	56.4386	56.4386 (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)	-122.5061	-122.5061	-122.5061	-122.5061	-122.5061	-122.5061	-122.5061	-122.5061	-122.5061	-122.5061	-122.5061	-122.5061 (71)
Water heating gains (Table 5)	146.2437	143.9398	139.9681	131.8851	126.7756	121.4826	118.5208	121.4186	124.7517	130.6058	138.3838	145.2640 (72)
Total internal gains	944.9013	941.8721	911.1841	857.5523	800.2664	750.1500	721.7281	725.3513	755.4007	806.8036	866.7580	918.4616 (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						
Northeast		1.8700	15.8738	0.5700	1.0000	0.7700	11.7255 (75)					
Southeast		26.8300	48.3051	0.5700	1.0000	0.7700	511.9435 (77)					
Southwest		9.9900	48.3051	0.5700	1.0000	0.7700	190.6193 (79)					
Northwest		4.7800	15.8738	0.5700	1.0000	0.7700	29.9721 (81)					
Solar gains	744.2604	1069.9596	1458.7699	1911.5048	2062.0864	2237.0790	1915.3423	1864.5828	1657.6396	1205.8948	837.8939	637.6981 (83)
Total gains	1689.1617	2011.8318	2369.9540	2769.0571	2862.3528	2987.2289	2637.0704	2589.9341	2413.0404	2012.6984	1704.6519	1556.1598 (84)

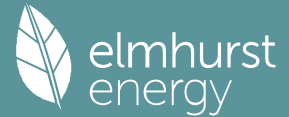
7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
tau	73.6936	74.5644	74.7854	76.1391	76.1391	77.5427	77.3051	77.5427	76.8345	75.0077	74.7854	73.6936
alpha	5.9129	5.9710	5.9857	6.0759	6.0759	6.1695	6.1537	6.1695	6.1223	6.0005	5.9857	5.9129
util living area	0.9874	0.9681	0.9119	0.7794	0.6307	0.4187	0.3536	0.3589	0.5197	0.8161	0.9626	0.9903 (86)
Living	20.2898	20.4758	20.7100	20.9055	20.9757	20.9983	20.9995	20.9995	20.9942	20.9021	20.5979	20.2693
Non living	19.5699	19.7571	19.9772	20.1558	20.2085	20.2353	20.2337	20.2359	20.2270	20.1483	19.8791	19.5502
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10
MIT	20.6367	20.4758	20.7100	20.9055	20.9757	20.9983	20.9995	20.9995	20.9942	20.9021	20.5979	20.3715 (87)
Th 2	20.1992	20.2079	20.2100	20.2230	20.2230	20.2361	20.2339	20.2361	20.2296	20.2122	20.2100	20.1992 (88)
util rest of house	0.9835	0.9592	0.8908	0.7414	0.5816	0.3676	0.2949	0.2995	0.4572	0.7683	0.9498	0.9872 (89)
MIT 2	19.8773	19.7571	19.9772	20.1558	20.2085	20.2353	20.2337	20.2359	20.2270	20.1483	19.8791	19.6410 (90)
Living area fraction												fLA = Living area / (4) = 0.2391 (91)
MIT	20.0589	19.9289	20.1524	20.3350	20.3919	20.4177	20.4168	20.4185	20.4104	20.3285	20.0509	19.8156 (92)
Temperature adjustment												0.0000
adjusted MIT	20.0589	19.9289	20.1524	20.3350	20.3919	20.4177	20.4168	20.4185	20.4104	20.3285	20.0509	19.8156 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9827	0.9554	0.8891	0.7472	0.5925	0.3798	0.3089	0.3137	0.4721	0.7759	0.9467	0.9853 (94)
Useful gains	1659.9376	1922.1797	2107.1867	2068.9347	1695.9826	1134.6065	814.6532	812.4598	1139.0837	1561.6332	1613.8437	1533.2098 (95)
Ext temp.	6.4000	6.7000	7.9000	9.6000	12.0000	14.8000	16.4000	16.4000	14.8000	12.2000	9.3000	6.8000 (96)
Heat loss rate W	2907.3867	2782.9881	2569.9404	2211.6392	1728.9097	1136.4200	815.0632	812.8981	1145.3979	1699.8975	2255.0020	2770.4718 (97)
Space heating kWh	928.1021	578.4633	344.2887	102.7472	24.4978	0.0000	0.0000	0.0000	0.0000	102.8687	461.6340	920.5230 (98a)
Space heating requirement - total per year (kWh/year)												3463.1248
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)												0.0000
Space heating kWh												

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928.1021	578.4633	344.2887	102.7472	24.4978	0.0000	0.0000	0.0000	0.0000	102.8687	461.6340	920.5230 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)											
Space heating per m2											
(98c) / (4) = 14.0372 (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 %)												313.6070 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												65.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	928.1021	578.4633	344.2887	102.7472	24.4978	0.0000	0.0000	0.0000	0.0000	102.8687	461.6340	920.5230 (98)
Space heating efficiency (main heating system 1)	313.6070	313.6070	313.6070	313.6070	313.6070	0.0000	0.0000	0.0000	0.0000	313.6070	313.6070	313.6070 (210)
Space heating fuel (main heating system)	295.9443	184.4548	109.7835	32.7631	7.8116	0.0000	0.0000	0.0000	0.0000	32.8018	147.2014	293.5275 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating requirement	219.4714	193.9467	206.2500	182.4907	177.5512	160.7593	159.4905	165.5644	167.0441	185.3010	195.7690	217.2794 (64)
Efficiency of water heater (217)m	178.0903	178.0903	178.0903	178.0903	178.0903	178.0903	178.0903	178.0903	178.0903	178.0903	178.0903	178.0903 (216)
Fuel for water heating, kWh/month	123.2360	108.9036	115.8120	102.4709	99.6973	90.2684	89.5560	92.9666	93.7974	104.0489	109.9268	122.0052 (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	120.3692	108.7206	120.3692	116.4864	120.3692	116.4864	120.3692	120.3692	116.4864	120.3692	116.4864	120.3692 (231)
Lighting	55.8164	44.7780	40.3176	29.5384	22.8163	18.6411	20.8138	27.0546	35.1412	46.1072	52.0780	57.3677 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-113.4590	-175.7204	-326.9286	-476.6923	-563.4918	-589.2449	-528.5923	-488.8193	-376.3174	-236.3049	-130.0197	-92.1247 (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	-0.7052	-2.6424	-12.4782	-42.8690	-75.2102	-103.5034	-76.1690	-60.4027	-29.7764	-7.4510	-1.3636	-0.4408 (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												1104.2880 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												178.0903
Water heating fuel used												1252.6892 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.7780)												
mechanical ventilation fans (SFP = 1.7780)												1417.2506 (230a)
Total electricity for the above, kWh/year												1417.2506 (231)
Electricity for lighting (calculated in Appendix L)												450.4704 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-4510.7270 (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												172.9075 (238)

10a. Fuel costs - using BEDF prices (533)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1104.2880	21.5100	237.5323 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1252.6892	21.5100	269.4534 (247)
Energy for instantaneous electric shower(s)	458.9363	21.5100	98.7172 (247a)
Pumps, fans and electric keep-hot	1417.2506	21.5100	304.8506 (249)
Energy for lighting	450.4704	21.5100	96.8962 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-4097.7151	21.5100	-881.4185
PV Unit electricity exported	-413.0119	5.5900	-23.0874
Total			-904.5059 (252)
Total energy cost			102.9439 (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	1104.2880	0.1583	174.7983 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1252.6892	0.1407	176.3096 (264)

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Energy for instantaneous electric shower(s)	458.9363	0.1391	63.8482 (264a)
Space and water heating			351.1078 (265)
Pumps, fans and electric keep-hot	1417.2506	0.1387	196.5901 (267)
Energy for lighting	450.4704	0.1443	65.0168 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-4097.7151	0.1308	-536.0054
PV Unit electricity exported	-413.0119	0.1145	-47.3023
Total			-583.3077 (269)
Total CO2, kg/year			93.2552 (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	1104.2880	1.5859	1751.3149 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1252.6892	1.5204	1904.6081 (278)
Energy for instantaneous electric shower(s)	458.9363	1.5143	694.9829 (278a)
Space and water heating			3655.9230 (279)
Pumps, fans and electric keep-hot	1417.2506	1.5128	2144.0167 (281)
Energy for lighting	450.4704	1.5338	690.9465 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-4097.7151	1.4832	-6077.7031
PV Unit electricity exported	-413.0119	0.4198	-173.3933
Total			-6251.0964 (283)
Total Primary energy kWh/year			934.7727 (286)

 SAP 10 EPC IMPROVEMENTS

03_BWA specification

Current energy efficiency rating:	A 95
Current environmental impact rating:	A 99

N Solar water heating	SAP increase too small
U Solar photovoltaic panels	Already installed
V2 Wind turbine	Not applicable

Recommended measures: (none)	SAP change	Cost change	CO2 change
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Measures omitted - SAP change or cost saving too small:			
N Solar water heating	+ 0.9	-£ 68	-44 kg (46.8%)

Recommended measures (none)	Total Savings	£0	Typical annual savings	0.00 kg/m²	Energy efficiency	Environmental impact
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Potential energy efficiency rating:	A 95
Potential environmental impact rating:	A 99

Fuel prices for cost data on this page from database revision number 533 TEST (30 Nov 2023)
 Recommendation texts revision number 6.1 (11 Jun 2019)

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

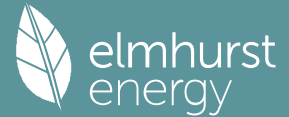
	Current £1007	Potential £1007	England): Saving £0
Electricity			
Space heating	£542	£542	£0
Water heating	£368	£368	£0
Lighting	£97	£97	£0
Generated (PV)	-£905	-£905	£0
Total cost of fuels	£102	£102	£0
Total cost of uses	£102	£102	£0
Delivered energy	1 kWh/m²	1 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.1 tonnes	0.1 tonnes	0.0 tonnes
CO2 emissions per m²	0 kg/m²	0 kg/m²	0 kg/m²
Primary energy	4 kWh/m²	4 kWh/m²	0 kWh/m²

 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 (m2)	Storey height (m)	Volume (m3)
Basement floor	83.9300 (1a)	x 2.5200 (2a)	= 211.5036 (1a) - (3a)
Ground floor	90.4700 (1b)	x 2.7500 (2b)	= 248.7925 (1b) - (3b)
First floor	72.3100 (1c)	x 2.6700 (2c)	= 193.0677 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	246.7100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	653.3638 (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												1 * 10 =	10.0000 (6c)
Number of flues attached to solid fuel boiler												0 * 20 =	0.0000 (6d)
Number of flues attached to other heater												0 * 35 =	0.0000 (6e)
Number of blocked chimneys												0 * 20 =	0.0000 (6f)
Number of intermittent extract fans												0 * 10 =	0.0000 (7a)
Number of passive vents												0 * 10 =	0.0000 (7b)
Number of flueless gas fires												0 * 40 =	0.0000 (7c)
												Air changes per hour	
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =											10.0000 / (5) =	0.0153 (8)
Pressure test												Yes	
Pressure Test Method												Blower Door	
Measured/design AP50												2.0000	(17)
Infiltration rate												0.1153	(18)
Number of sides sheltered												0	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =											1.0000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =											0.1153	(21)
												Effective ac	
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Adj infiltr rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Balanced mechanical ventilation with heat recovery	0.1470	0.1441	0.1412	0.1268	0.1240	0.1095	0.1095	0.1067	0.1153	0.1240	0.1297	0.1355	(22b)
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												73.8000	(23c)
Effective ac	0.2780	0.2751	0.2722	0.2578	0.2550	0.2405	0.2405	0.2377	0.2463	0.2550	0.2607	0.2665	(25)

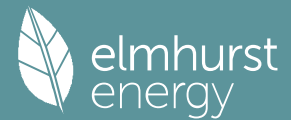
3. Heat losses and heat loss parameter

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						
Typical Window (Uw = 1.00)			43.4700	0.9615	41.7981		(27)						
Entrance Door			3.7800	1.0000	3.7800		(26a)						
Lower Ground Floor			83.9300	0.1100	9.2323	110.0000	9232.3000 (28a)						
Ground Floor			7.6900	0.1100	0.8459	110.0000	845.9000 (28a)						
Typical External Wall	317.3323	47.2500	270.0823	0.1600	43.2132	110.0000	29709.0530 (29a)						
LGF Exposed Roof	3.7100		3.7100	0.1300	0.4823	9.0000	33.3900 (30)						
GF Exposed Roof (Living Room)	5.3900		5.3900	0.1300	0.7007	9.0000	48.5100 (30)						
GF Exposed Roof (Kitchen)	5.0800		5.0800	0.1300	0.6604	9.0000	45.7200 (30)						
GF Exposed Roof (Breakfast)	7.6900		7.6900	0.1300	0.9997	9.0000	69.2100 (30)						
FF Main Roof	49.4500		49.4500	0.1200	5.9340	9.0000	445.0500 (30)						
FF Parapet Roof	22.8600		22.8600	0.1300	2.9718	9.0000	205.7400 (30)						
Total net area of external elements Aum(A, m2)			503.1323				(31)						
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	110.6183	(33)						
LGF Blockwork			54.4100			75.0000	4080.7500 (32c)						
LGF Studwork			92.0400			9.0000	828.3600 (32c)						
GF Blockwork			51.6500			75.0000	3873.7500 (32c)						
FF Blockwork			17.0900			75.0000	1281.7500 (32c)						
GF Studwork			91.1800			9.0000	820.6200 (32c)						
FF Studwork			87.2900			9.0000	785.6100 (32c)						
GF Floor			82.7900			18.0000	1490.2200 (32d)						
FF Floor			72.3100			18.0000	1301.5800 (32d)						
LGF Internal Ceiling			80.2300			9.0000	722.0700 (32e)						
GF Internal Ceiling			72.3100			9.0000	650.7900 (32e)						
Heat capacity Cm = Sum(A x k)												(28)...(30) + (32) + (32a)...(32e) =	56470.3730 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K													228.8937 (35)
List of Thermal Bridges													
K1 Element				Length	Psi-value	Total							
E1 Steel lintel with perforated steel base plate				31.3500	0.0280	0.8778							
E3 Sill				29.5500	0.0270	0.7979							
E4 Jamb				81.6800	0.0210	1.7153							
E5 Ground floor (normal)				45.9890	0.1610	7.4042							
E6 Intermediate floor within a dwelling				73.7030	0.0020	0.1474							
E8 Balcony within a dwelling, wall insulation continuous				17.6590	0.1000	1.7659							
E14 Flat roof				51.9530	0.1600	8.3125							
E15 Flat roof with parapet				13.6590	0.3000	4.0977							
E16 Corner (normal)				43.1900	0.0480	2.0731							
E17 Corner (inverted - internal area greater than external area)				10.9300	-0.0810	-0.8853							
E22 Basement floor				25.9780	0.2200	5.7152							
E24 Eaves (insulation at ceiling level - inverted)				18.7760	0.1500	2.8164							
Thermal bridges (Sum(L x Psi) calculated using Appendix K)												34.8380	(36)
Point Thermal bridges												(36a) =	0.0000
Total fabric heat loss												(33) + (36) + (36a) =	145.4563 (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	59.9427	59.3212	58.6996	55.5920	54.9705	51.8629	51.8629	51.2413	53.1059	54.9705	56.2135	57.4566	(38)
Average = Sum(39)m / 12 =	205.3990	204.7775	204.1560	201.0484	200.4268	197.3192	197.3192	196.6977	198.5623	200.4268	201.6699	202.9129	(39)
												200.8930	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	0.8326	0.8300	0.8275	0.8149	0.8124	0.7998	0.7998	0.7973	0.8048	0.8124	0.8174	0.8225	(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 3.0627 (42)

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Hot water usage for mixer showers	25.1902	24.8116	24.2600	23.2045	22.4256	21.5570	21.0633	21.6107	22.2109	23.1435	24.2216	25.0937 (42a)
Hot water usage for baths	32.6210	32.1365	31.4543	30.1964	29.2545	28.2101	27.6459	28.3234	29.0610	30.1786	31.4624	32.5107 (42b)
Hot water usage for other uses	45.9946	44.3221	42.6496	40.9770	39.3045	37.6320	37.6320	39.3045	40.9770	42.6496	44.3221	45.9946 (42c)
Average daily hot water use (litres/day)												95.2826 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy content (annual)	103.8058	101.2702	98.3638	94.3779	90.9846	87.3990	86.3412	89.2386	92.2489	95.9716	100.0061	103.5990 (44)
Distribution loss (46)m = 0.15 x (45)m	164.4030	144.2075	151.1816	129.1987	122.4828	107.4673	104.4221	110.4960	113.7521	130.2326	142.4770	162.2110 (45)
Water storage loss:	24.6605	21.6311	22.6772	19.3798	18.3724	16.1201	15.6633	16.5744	17.0628	19.5349	21.3716	24.3317 (46)
Store volume												300.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.9000 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												1.0260 (55)
Total storage loss	31.8060	28.7280	31.8060	30.7800	31.8060	30.7800	31.8060	31.8060	30.7800	31.8060	30.7800	31.8060 (56)
If cylinder contains dedicated solar storage	31.8060	28.7280	31.8060	30.7800	31.8060	30.7800	31.8060	31.8060	30.7800	31.8060	30.7800	31.8060 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	219.4714	193.9467	206.2500	182.4907	177.5512	160.7593	159.4905	165.5644	167.0441	185.3010	195.7690	217.2794 (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 (63a)
Output from w/h	219.4714	193.9467	206.2500	182.4907	177.5512	160.7593	159.4905	165.5644	167.0441	185.3010	195.7690	217.2794 (64)
Electric shower(s)	40.3463	35.9488	39.2548	37.4603	38.1633	36.4041	37.6175	38.1633	37.4603	39.2548	38.5166	40.3463 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												458.9363 (64a)
Heat gains from water heating, kWh/month	108.8053	96.7276	104.1363	94.9572	94.3211	87.4675	88.1795	90.3355	89.8213	97.1707	99.6364	108.0764 (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	183.7592	183.7592	183.7592	183.7592	183.7592	183.7592	183.7592	183.7592	183.7592	183.7592	183.7592	183.7592 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	63.7687	56.6388	46.0618	34.8717	26.0670	22.0069	23.7792	30.9091	41.4862	52.6762	61.4809	65.5411 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	617.1973	623.6019	607.4625	573.1038	529.7321	488.9688	461.7364	455.3319	471.4712	505.8299	549.2016	589.9649 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	56.4386	56.4386	56.4386	56.4386	56.4386	56.4386	56.4386	56.4386	56.4386	56.4386	56.4386	56.4386 (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)	-122.5061	-122.5061	-122.5061	-122.5061	-122.5061	-122.5061	-122.5061	-122.5061	-122.5061	-122.5061	-122.5061	-122.5061 (71)
Water heating gains (Table 5)	146.2437	143.9398	139.9681	131.8851	126.7756	121.4826	118.5208	121.4186	124.7517	130.6058	138.3838	145.2640 (72)
Total internal gains	944.9013	941.8721	911.1841	857.5523	800.2664	750.1500	721.7281	725.3513	755.4007	806.8036	866.7580	918.4616 (73)

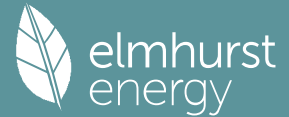
6. Solar gains

[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							
Northeast	1.8700	11.2829	0.5700	1.0000	0.7700	8.3344 (75)						
Southeast	26.8300	36.7938	0.5700	1.0000	0.7700	389.9454 (77)						
Southwest	9.9900	36.7938	0.5700	1.0000	0.7700	145.1940 (79)						
Northwest	4.7800	11.2829	0.5700	1.0000	0.7700	21.3039 (81)						
Solar gains	564.7776	971.8698	1355.9037	1723.8602	1970.8730	1974.2179	1896.0336	1709.0607	1482.9097	1081.1736	678.2662	482.1718 (83)
Total gains	1509.6789	1913.7419	2267.0878	2581.4125	2771.1394	2724.3679	2617.7616	2434.4120	2238.3105	1887.9772	1545.0242	1400.6335 (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	76.3695	76.6013	76.8345	78.0221	78.2640	79.4966	79.4966	79.7478	78.9990	78.2640	77.7816	77.3051
alpha	6.0913	6.1068	6.1223	6.2015	6.2176	6.2998	6.2998	6.3165	6.2666	6.2176	6.1854	6.1537
util living area	0.9962	0.9845	0.9462	0.8343	0.6528	0.4616	0.3314	0.3712	0.6008	0.9002	0.9886	0.9975 (86)
Living	20.0440	20.2984	20.5950	20.8610	20.9726	20.9973	20.9997	20.9995	20.9874	20.8082	20.3648	19.9994
Non living	19.3474	19.6004	19.8879	20.1365	20.2257	20.2523	20.2534	20.2555	20.2429	20.0992	19.6766	19.3101
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10
MIT	20.5109	20.2984	20.5950	20.8610	20.9726	20.9973	20.9997	20.9995	20.9874	20.8082	20.3648	20.1394 (87)
Th 2	20.2252	20.2274	20.2296	20.2404	20.2426	20.2535	20.2535	20.2557	20.2491	20.2426	20.2382	20.2339 (88)
util rest of house	0.9951	0.9804	0.9331	0.8024	0.6056	0.4086	0.2753	0.3114	0.5399	0.8713	0.9849	0.9968 (89)
MIT 2	19.7761	19.6004	19.8879	20.1365	20.2257	20.2523	20.2534	20.2555	20.2429	20.0992	19.6766	19.4393 (90)
Living area fraction												0.2391 (91)
MIT	19.9518	19.7673	20.0570	20.3097	20.4043	20.4304	20.4318	20.4334	20.4208	20.2687	19.8411	19.6067 (92)
Temperature adjustment												0.0000
adjusted MIT	19.9518	19.7673	20.0570	20.3097	20.4043	20.4304	20.4318	20.4334	20.4208	20.2687	19.8411	19.6067 (93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9947	0.9774	0.9297	0.8055	0.6159	0.4212	0.2888	0.3257	0.5541	0.8724	0.9824	0.9960	(94)
Useful gains	1501.6270	1870.4155	2107.7385	2079.4274	1706.8557	1147.5383	755.8807	792.9055	1240.1724	1647.1221	1517.8275	1395.0887	(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	3214.8642	3044.4908	2767.7360	2293.9096	1744.5731	1150.4542	756.0959	793.3549	1255.0821	1937.8741	2569.5057	3126.2161	(97)
Space heating kWh	1274.6485	788.9786	491.0382	154.4272	28.0617	0.0000	0.0000	0.0000	0.0000	216.3194	757.2083	1287.9588	(98a)
Space heating requirement - total per year (kWh/year)	4998.6408												
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)	0.0000												
Space heating kWh	1274.6485	788.9786	491.0382	154.4272	28.0617	0.0000	0.0000	0.0000	0.0000	216.3194	757.2083	1287.9588	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)	4998.6408												
Space heating per m2												(98c) / (4) =	20.2612 (99)

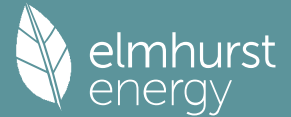
9a. Energy requirements - Individual heating systems, including micro-CHP

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
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 %)													313.7572	(206)
Efficiency of main space heating system 2 (in %)													0.0000	(207)
Efficiency of secondary/supplementary heating system, %													65.0000	(208)
Space heating requirement	1274.6485	788.9786	491.0382	154.4272	28.0617	0.0000	0.0000	0.0000	0.0000	216.3194	757.2083	1287.9588	(98)	
Space heating efficiency (main heating system 1)	313.7572	313.7572	313.7572	313.7572	313.7572	0.0000	0.0000	0.0000	0.0000	313.7572	313.7572	313.7572	(210)	
Space heating fuel (main heating system)	406.2531	251.4615	156.5026	49.2187	8.9438	0.0000	0.0000	0.0000	0.0000	68.9448	241.3357	410.4953	(211)	
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)	
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)	
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)	
Water heating requirement	219.4714	193.9467	206.2500	182.4907	177.5512	160.7593	159.4905	165.5644	167.0441	185.3010	195.7690	217.2794	(64)	
Efficiency of water heater (217)m	178.0713	178.0713	178.0713	178.0713	178.0713	178.0713	178.0713	178.0713	178.0713	178.0713	178.0713	178.0713	(216)	
Fuel for water heating, kWh/month	123.2492	108.9152	115.8244	102.4818	99.7079	90.2781	89.5656	92.9765	93.8074	104.0600	109.9386	122.0182	(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	120.3692	108.7206	120.3692	116.4864	120.3692	116.4864	120.3692	120.3692	116.4864	120.3692	116.4864	120.3692	(232)	
Lighting	55.8164	44.7780	40.3176	29.5384	22.8163	18.6411	20.8138	27.0546	35.1412	46.1072	52.0780	57.3677	(231)	
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-79.9554	-148.8888	-287.7555	-418.3998	-529.2759	-523.3952	-513.0779	-439.1992	-323.2467	-199.0752	-97.9380	-64.6316	(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	-0.2680	-1.6048	-8.4541	-29.4978	-63.1433	-73.8016	-70.0847	-45.2269	-20.1415	-4.5689	-0.5994	-0.1643	(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												1593.1555	(211)	
Space heating fuel - main system 2												0.0000	(213)	
Space heating fuel - secondary												0.0000	(215)	
Efficiency of water heater												178.0713	(216)	
Water heating fuel used												1252.8229	(219)	
Space cooling fuel												0.0000	(221)	
Electricity for pumps and fans: (BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.7780)												1417.2506	(230a)	
mechanical ventilation fans (SFP = 1.7780)												1417.2506	(231)	
Total electricity for the above, kWh/year												450.4704	(232)	
Electricity for lighting (calculated in Appendix L)												450.4704	(232)	
Energy saving/generation technologies (Appendices M ,N and Q)														
PV generation												-3942.3947	(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												1230.2410	(238)	

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1593.1555	16.4900	262.7113 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1252.8229	16.4900	206.5905 (247)
Energy for instantaneous electric shower(s)	458.9363	16.4900	75.6786 (247a)
Pumps, fans and electric keep-hot	1417.2506	16.4900	233.7046 (249)
Energy for lighting	450.4704	16.4900	74.2826 (250)
Additional standing charges			0.0000 (251)

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Energy saving/generation technologies			
PV Unit electricity used in dwelling	-3624.8392	16.4900	-597.7360
PV Unit electricity exported	-317.5555	5.5900	-17.7514
Total			-615.4873 (252)
Total energy cost			237.4803 (255)

 11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):			0.3600 (256)
Energy cost factor (ECF)		[(255) x (256)] / [(4) + 45.0] =	0.2931 (257)
SAP value			95.2493
SAP rating (Section 12)			95 (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	1593.1555	0.1578	251.3458 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1252.8229	0.1407	176.3284 (264)
Energy for instantaneous electric shower(s)	458.9363	0.1391	63.8482 (264a)
Space and water heating			427.6742 (265)
Pumps, fans and electric keep-hot	1417.2506	0.1387	196.5901 (267)
Energy for lighting	450.4704	0.1443	65.0168 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-3624.8392	0.1300	-471.3604
PV Unit electricity exported	-317.5555	0.1132	-35.9522
Total			-507.3126 (269)
Total CO2, kg/year			245.8167 (272)
CO2 emissions per m2			1.0000 (273)
EI value			98.8708
EI rating			99 (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)
Basement floor	83.9300 (1a)	x 2.5200 (2a)	= 211.5036 (1a) - (3a)
Ground floor	90.4700 (1b)	x 2.7500 (2b)	= 248.7925 (1b) - (3b)
First floor	72.3100 (1c)	x 2.6700 (2c)	= 193.0677 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	246.7100		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 653.3638 (5)

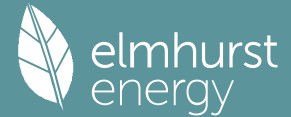
 2. Ventilation rate

Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	1 * 10 =	10.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	10.0000 / (5) =	0.0153 (8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50			2.0000 (17)
Infiltration rate			0.1153 (18)
Number of sides sheltered			0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =		1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =		0.1153 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	6.3000	5.9000	5.8000	5.2000	5.2000	4.6000	4.7000	4.6000	4.9000	5.7000	5.8000	6.3000 (22)
Wind factor	1.5750	1.4750	1.4500	1.3000	1.3000	1.1500	1.1750	1.1500	1.2250	1.4250	1.4500	1.5750 (22a)
Adj infilt rate	0.1816	0.1701	0.1672	0.1499	0.1499	0.1326	0.1355	0.1326	0.1412	0.1643	0.1672	0.1816 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												73.8000 (23c)
Effective ac	0.3126	0.3011	0.2982	0.2809	0.2809	0.2636	0.2665	0.2636	0.2722	0.2953	0.2982	0.3126 (25)

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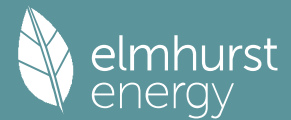
3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K						
Typical Window (Uw = 1.00)			43.4700	0.9615	41.7981			(27)					
Entrance Door			3.7800	1.0000	3.7800			(26a)					
Lower Ground Floor			83.9300	0.1100	9.2323	110.0000	9232.3000	(28a)					
Ground Floor			7.6900	0.1100	0.8459	110.0000	845.9000	(28a)					
Typical External Wall	317.3323	47.2500	270.0823	0.1600	43.2132	110.0000	29709.0530	(29a)					
LGF Exposed Roof	3.7100		3.7100	0.1300	0.4823	9.0000	33.3900	(30)					
GF Exposed Roof (Living Room)	5.3900		5.3900	0.1300	0.7007	9.0000	48.5100	(30)					
GF Exposed Roof (Kitchen)	5.0800		5.0800	0.1300	0.6604	9.0000	45.7200	(30)					
GF Exposed Roof (Breakfast)	7.6900		7.6900	0.1300	0.9997	9.0000	69.2100	(30)					
FF Main Roof	49.4500		49.4500	0.1200	5.9340	9.0000	445.0500	(30)					
FF Parapet Roof	22.8600		22.8600	0.1300	2.9718	9.0000	205.7400	(30)					
Total net area of external elements Aum(A, m2)			503.1323					(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	110.6183			(33)					
LGF Blockwork			54.4100			75.0000	4080.7500	(32c)					
LGF Studwork			92.0400			9.0000	828.3600	(32c)					
GF Blockwork			51.6500			75.0000	3873.7500	(32c)					
FF Blockwork			17.0900			75.0000	1281.7500	(32c)					
GF Studwork			91.1800			9.0000	820.6200	(32c)					
FF Studwork			87.2900			9.0000	785.6100	(32c)					
GF Floor			82.7900			18.0000	1490.2200	(32d)					
FF Floor			72.3100			18.0000	1301.5800	(32d)					
LGF Internal Ceiling			80.2300			9.0000	722.0700	(32e)					
GF Internal Ceiling			72.3100			9.0000	650.7900	(32e)					
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) =	56470.3730 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								228.8937 (35)					
List of Thermal Bridges													
K1 Element				Length	Psi-value		Total						
E1 Steel lintel with perforated steel base plate				31.3500	0.0280		0.8778						
E3 Sill				29.5500	0.0270		0.7979						
E4 Jamb				81.6800	0.0210		1.7153						
E5 Ground floor (normal)				45.9890	0.1610		7.4042						
E6 Intermediate floor within a dwelling				73.7030	0.0020		0.1474						
E8 Balcony within a dwelling, wall insulation continuous				17.6590	0.1000		1.7659						
E14 Flat roof				51.9530	0.1600		8.3125						
E15 Flat roof with parapet				13.6590	0.3000		4.0977						
E16 Corner (normal)				43.1900	0.0480		2.0731						
E17 Corner (inverted - internal area greater than external area)				10.9300	-0.0810		-0.8853						
E22 Basement floor				25.9780	0.2200		5.7152						
E24 Eaves (insulation at ceiling level - inverted)				18.7760	0.1500		2.8164						
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								34.8380 (36)					
Point Thermal bridges							(36a) =	0.0000					
Total fabric heat loss							(33) + (36) + (36a) =	145.4563 (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	
	67.4010	64.9149	64.2934	60.5642	60.5642	56.8351	57.4566	56.8351	58.6996	63.6718	64.2934	67.4010	(38)
Heat transfer coeff	212.8573	210.3712	209.7497	206.0206	206.0206	202.2914	202.9129	202.2914	204.1560	209.1282	209.7497	212.8573	(39)
Average = Sum(39)m / 12 =													207.3672
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.8628	0.8527	0.8502	0.8351	0.8351	0.8200	0.8225	0.8200	0.8275	0.8477	0.8502	0.8628	(40)
HLP (average)													0.8405
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy														3.0627 (42)
Hot water usage for mixer showers														
	25.1902	24.8116	24.2600	23.2045	22.4256	21.5570	21.0633	21.6107	22.2109	23.1435	24.2216	25.0937	25.0937	(42a)
Hot water usage for baths														
	32.6210	32.1365	31.4543	30.1964	29.2545	28.2101	27.6459	28.3234	29.0610	30.1786	31.4624	32.5107	32.5107	(42b)
Hot water usage for other uses														
	45.9946	44.3221	42.6496	40.9770	39.3045	37.6320	37.6320	39.3045	40.9770	42.6496	44.3221	45.9946	45.9946	(42c)
Average daily hot water use (litres/day)														95.2826 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
	103.8058	101.2702	98.3638	94.3779	90.9846	87.3990	86.3412	89.2386	92.2489	95.9716	100.0061	103.5990	(44)	
Energy conte	164.4030	144.2075	151.1816	129.1987	122.4828	107.4673	104.4221	110.4960	113.7521	130.2326	142.4770	162.2110	(45)	
Energy content (annual)													1582.5317	
Distribution loss (46)m = 0.15 x (45)m														
	24.6605	21.6311	22.6772	19.3798	18.3724	16.1201	15.6633	16.5744	17.0628	19.5349	21.3716	24.3317	(46)	
Water storage loss:														
Store volume														300.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):														1.9000 (48)
Temperature factor from Table 2b														0.5400 (49)
Enter (49) or (54) in (55)														1.0260 (55)
Total storage loss														
	31.8060	28.7280	31.8060	30.7800	31.8060	30.7800	31.8060	31.8060	30.7800	31.8060	30.7800	31.8060	(56)	
If cylinder contains dedicated solar storage														
	31.8060	28.7280	31.8060	30.7800	31.8060	30.7800	31.8060	31.8060	30.7800	31.8060	30.7800	31.8060	(57)	
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)	
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)	
Total heat required for water heating calculated for each month														
	219.4714	193.9467	206.2500	182.4907	177.5512	160.7593	159.4905	165.5644	167.0441	185.3010	195.7690	217.2794	(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	219.4714	193.9467	206.2500	182.4907	177.5512	160.7593	159.4905	165.5644	167.0441	185.3010	195.7690	217.2794	(64)	
Total per year (kWh/year) = Sum(64)m =													2230.9177 (64)	
Electric shower(s)														
	40.3463	35.9488	39.2548	37.4603	38.1633	36.4041	37.6175	38.1633	37.4603	39.2548	38.5166	40.3463	(64a)	
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =													458.9363 (64a)	
Heat gains from water heating, kWh/month														
	108.8053	96.7276	104.1363	94.9572	94.3211	87.4675	88.1795	90.3355	89.8213	97.1707	99.6364	108.0764	(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	183.7592	183.7592	183.7592	183.7592	183.7592	183.7592	183.7592	183.7592	183.7592	183.7592	183.7592	183.7592 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	63.7687	56.6388	46.0618	34.8717	26.0670	22.0069	23.7792	30.9091	41.4862	52.6762	61.4809	65.5411 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	617.1973	623.6019	607.4625	573.1038	529.7321	488.9688	461.7364	455.3319	471.4712	505.8299	549.2016	589.9649 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	56.4386	56.4386	56.4386	56.4386	56.4386	56.4386	56.4386	56.4386	56.4386	56.4386	56.4386	56.4386 (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)	-122.5061	-122.5061	-122.5061	-122.5061	-122.5061	-122.5061	-122.5061	-122.5061	-122.5061	-122.5061	-122.5061	-122.5061 (71)
Water heating gains (Table 5)	146.2437	143.9398	139.9681	131.8851	126.7756	121.4826	118.5208	121.4186	124.7517	130.6058	138.3838	145.2640 (72)
Total internal gains	944.9013	941.8721	911.1841	857.5523	800.2664	750.1500	721.7281	725.3513	755.4007	806.8036	866.7580	918.4616 (73)

6. Solar gains

[Jan]	Area m ²	Solar flux Table 6a W/m ²	Specific data or Table 6b	g	Specific data or Table 6c	FF	Access factor Table 6d	Gains W				
Northeast	1.8700	15.8738	0.5700	1.0000	0.7700	0.7700	11.7255 (75)					
Southeast	26.8300	48.3051	0.5700	1.0000	0.7700	0.7700	511.9435 (77)					
Southwest	9.9900	48.3051	0.5700	1.0000	0.7700	0.7700	190.6193 (79)					
Northwest	4.7800	15.8738	0.5700	1.0000	0.7700	0.7700	29.9721 (81)					
Solar gains	744.2604	1069.9596	1458.7699	1911.5048	2062.0864	2237.0790	1915.3423	1864.5828	1657.6396	1205.8948	837.8939	637.6981 (83)
Total gains	1689.1617	2011.8318	2369.9540	2769.0571	2862.3528	2987.2289	2637.0704	2589.9341	2413.0404	2012.6984	1704.6519	1556.1598 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th _l (C)												
Utilisation factor for gains for living area, n _{l,m} (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	73.6936	74.5644	74.7854	76.1391	76.1391	77.5427	77.3051	77.5427	76.8345	75.0077	74.7854	73.6936
alpha	5.9129	5.9710	5.9857	6.0759	6.0759	6.1695	6.1537	6.1695	6.1223	6.0005	5.9857	5.9129
util living area	0.9874	0.9681	0.9119	0.7794	0.6307	0.4187	0.3536	0.3589	0.5197	0.8161	0.9626	0.9903 (86)
Living	20.2898	20.4758	20.7100	20.9055	20.9757	20.9983	20.9995	20.9995	20.9942	20.9021	20.5979	20.2693
Non living	19.5699	19.7571	19.9772	20.1558	20.2085	20.2353	20.2337	20.2359	20.2270	20.1483	19.8791	19.5502
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10
MIT	20.6367	20.4758	20.7100	20.9055	20.9757	20.9983	20.9995	20.9995	20.9942	20.9021	20.5979	20.3715 (87)
Th 2	20.1992	20.2079	20.2100	20.2230	20.2230	20.2361	20.2339	20.2361	20.2296	20.2122	20.2100	20.1992 (88)
util rest of house	0.9835	0.9592	0.8908	0.7414	0.5816	0.3676	0.2949	0.2995	0.4572	0.7683	0.9498	0.9872 (89)
MIT 2	19.8773	19.7571	19.9772	20.1558	20.2085	20.2353	20.2337	20.2359	20.2270	20.1483	19.8791	19.6410 (90)
Living area fraction	20.0589	19.9289	20.1524	20.3350	20.3919	20.4177	20.4168	20.4185	20.4104	20.3285	20.0509	19.8156 (91)
MIT	20.0589	19.9289	20.1524	20.3350	20.3919	20.4177	20.4168	20.4185	20.4104	20.3285	20.0509	19.8156 (92)
Temperature adjustment												0.0000
adjusted MIT	20.0589	19.9289	20.1524	20.3350	20.3919	20.4177	20.4168	20.4185	20.4104	20.3285	20.0509	19.8156 (93)

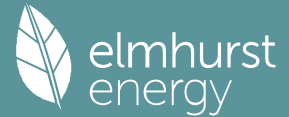
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9827	0.9554	0.8891	0.7472	0.5925	0.3798	0.3089	0.3137	0.4721	0.7759	0.9467	0.9853 (94)
Useful gains	1659.9376	1922.1797	2107.1867	2068.9347	1695.9826	1134.6065	814.6532	812.4598	1139.0837	1561.6332	1613.8437	1533.2098 (95)
Ext temp.	6.4000	6.7000	7.9000	9.6000	12.0000	14.8000	16.4000	16.4000	14.8000	12.2000	9.3000	6.8000 (96)
Heat loss rate W	2907.3867	2782.9881	2569.9404	2211.6392	1728.9097	1136.4200	815.0632	812.8981	1145.3979	1699.8975	2255.0020	2770.4718 (97)
Space heating kWh	928.1021	578.4633	344.2887	102.7472	24.4978	0.0000	0.0000	0.0000	0.0000	102.8687	461.6340	920.5230 (98a)
Space heating requirement - total per year (kWh/year)												3463.1248
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)												0.0000
Space heating kWh	928.1021	578.4633	344.2887	102.7472	24.4978	0.0000	0.0000	0.0000	0.0000	102.8687	461.6340	920.5230 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3463.1248
Space heating per m ²										(98c) / (4) =		14.0372 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												
Fraction of space heat from main system(s)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Efficiency of main space heating system 1 (in %)												313.6070 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												65.0000 (208)
Space heating requirement	928.1021	578.4633	344.2887	102.7472	24.4978	0.0000	0.0000	0.0000	0.0000	102.8687	461.6340	920.5230 (98)
Space heating efficiency (main heating system 1)	313.6070	313.6070	313.6070	313.6070	313.6070	0.0000	0.0000	0.0000	0.0000	313.6070	313.6070	313.6070 (210)
Space heating fuel (main heating system)	295.9443	184.4548	109.7835	32.7631	7.8116	0.0000	0.0000	0.0000	0.0000	32.8018	147.2014	293.5275 (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)

Full SAP Calculation Printout



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	0.0000	(215)
Water heating														
Water heating requirement	219.4714	193.9467	206.2500	182.4907	177.5512	160.7593	159.4905	165.5644	167.0441	185.3010	195.7690	217.2794	178.0903	(64)
Efficiency of water heater	178.0903	178.0903	178.0903	178.0903	178.0903	178.0903	178.0903	178.0903	178.0903	178.0903	178.0903	178.0903	178.0903	(216)
(217)m	178.0903	178.0903	178.0903	178.0903	178.0903	178.0903	178.0903	178.0903	178.0903	178.0903	178.0903	178.0903	178.0903	(217)
Fuel for water heating, kWh/month	123.2360	108.9036	115.8120	102.4709	99.6973	90.2684	89.5560	92.9666	93.7974	104.0489	109.9268	122.0052	118.0903	(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	0.0000	(221)
Pumps and Fa	120.3692	108.7206	120.3692	116.4864	120.3692	116.4864	120.3692	120.3692	116.4864	120.3692	116.4864	120.3692	116.4864	(231)
Lighting	55.8164	44.7780	40.3176	29.5384	22.8163	18.6411	20.8138	27.0546	35.1412	46.1072	52.0780	57.3677	57.3677	(232)
Electricity generated by PVs (Appendix M) (negative quantity)														
(233a)m	-113.4590	-175.7204	-326.9286	-476.6923	-563.4918	-589.2449	-528.5923	-488.8193	-376.3174	-236.3049	-130.0197	-92.1247	-92.1247	(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	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	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	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)														
(233b)m	-0.7052	-2.6424	-12.4782	-42.8690	-75.2102	-103.5034	-76.1690	-60.4027	-29.7764	-7.4510	-1.3636	-0.4408	-0.4408	(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	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													1104.2880	(211)
Space heating fuel - main system 2													0.0000	(213)
Space heating fuel - secondary													0.0000	(215)
Efficiency of water heater													178.0903	(216)
Water heating fuel used													1252.6892	(219)
Space cooling fuel													0.0000	(221)
Electricity for pumps and fans:														
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.7780)														
mechanical ventilation fans (SFP = 1.7780)													1417.2506	(230a)
Total electricity for the above, kWh/year													1417.2506	(231)
Electricity for lighting (calculated in Appendix L)													450.4704	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV generation													-4510.7270	(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													172.9075	(238)

10a. Fuel costs - using BEDF prices (533)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1104.2880	21.5100	237.5323 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1252.6892	21.5100	269.4534 (247)
Energy for instantaneous electric shower(s)	458.9363	21.5100	98.7172 (247a)
Pumps, fans and electric keep-hot	1417.2506	21.5100	304.8506 (249)
Energy for lighting	450.4704	21.5100	96.8962 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-4097.7151	21.5100	-881.4185
PV Unit electricity exported	-413.0119	5.5900	-23.0874
Total			-904.5059 (252)
Total energy cost			102.9439 (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	1104.2880	0.1583	174.7983 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1252.6892	0.1407	176.3096 (264)
Energy for instantaneous electric shower(s)	458.9363	0.1391	63.8482 (264a)
Space and water heating			351.1078 (265)
Pumps, fans and electric keep-hot	1417.2506	0.1387	196.5901 (267)
Energy for lighting	450.4704	0.1443	65.0168 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-4097.7151	0.1308	-536.0054
PV Unit electricity exported	-413.0119	0.1145	-47.3023
Total			-583.3077 (269)
Total CO2, kg/year			93.2552 (272)

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

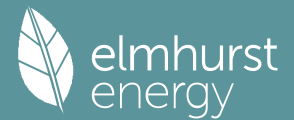
	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	1104.2880	1.5859	1751.3149 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1252.6892	1.5204	1904.6081 (278)
Energy for instantaneous electric shower(s)	458.9363	1.5143	694.9829 (278a)
Space and water heating			3655.9230 (279)
Pumps, fans and electric keep-hot	1417.2506	1.5128	2144.0167 (281)
Energy for lighting	450.4704	1.5338	690.9465 (282)

Full SAP Calculation Printout



Energy saving/generation technologies			
PV Unit electricity used in dwelling	-4097.7151	1.4832	-6077.7031
PV Unit electricity exported	-413.0119	0.4198	-173.3933
Total			-6251.0964 (283)
Total Primary energy kWh/year			934.7727 (286)

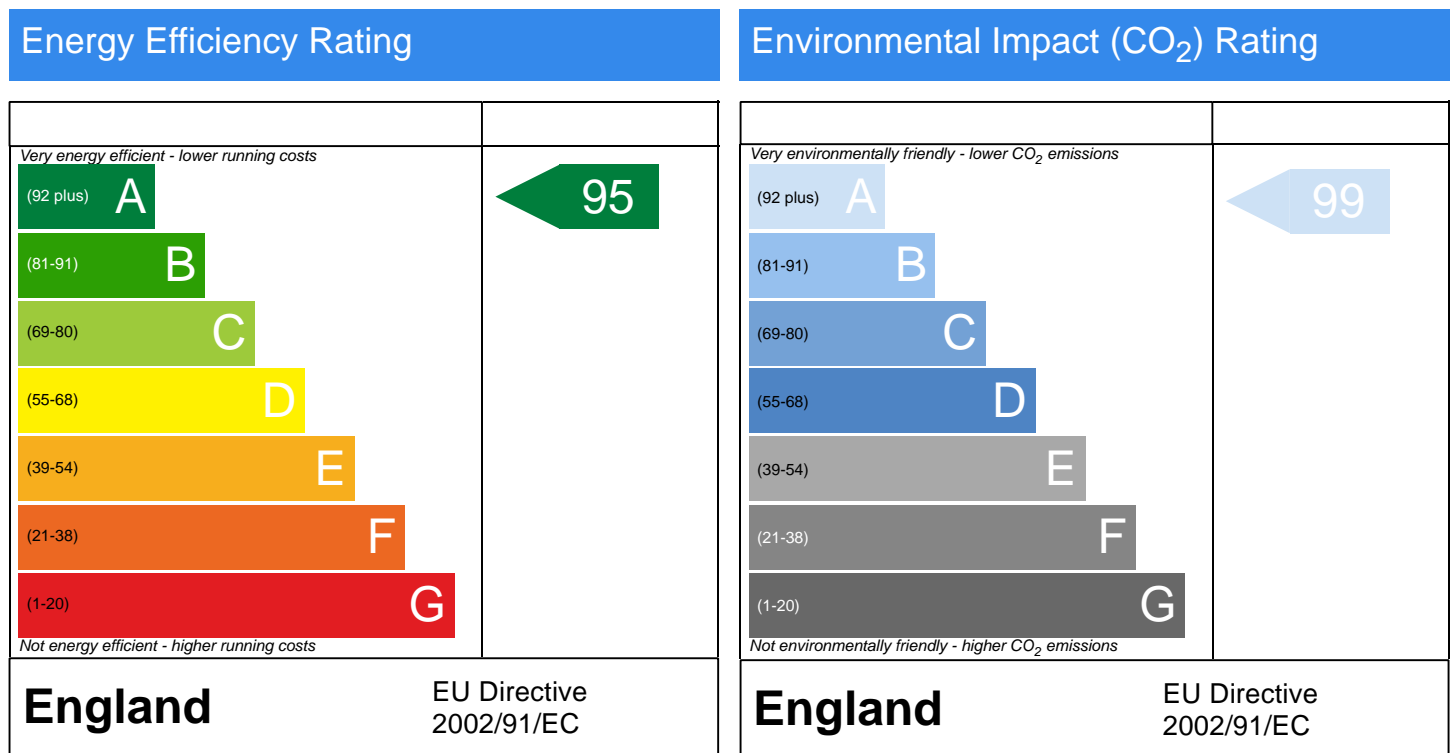
Predicted Energy Assessment



Plot 4A, Trevarrick Road, St Austell, Cornwall, PL25 5JN Dwelling type: House, Detached
 Date of assessment: 19/12/2023
 Produced by: Stuart Foster
 Total floor area: 246.71 m²
 DRRN: 4801-2592-9270

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.

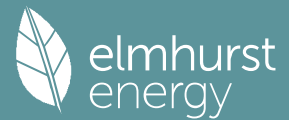
The energy performance has been assessed using the Government approved SAP 10 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO₂) emissions.



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



Property Reference	House	Issued on Date	19/12/2023
Assessment Reference	03_BWA specification	Prop Type Ref	
Property	Plot 4A, Trevarrick Road, St Austell, Cornwall, PL25 5JN		

SAP Rating	95 A	DER	1.06	TER	10.08
Environmental	99 A	% DER < TER			89.48
CO ₂ Emissions (t/year)	0.09	DFEE	36.52	TFEE	44.95
Compliance Check	See BREL	% DFEE < TFEE			18.75
% DPER < TPER	80.04	DPER	10.59	TPER	53.04

Assessor Details	Mr. Stuart Foster	Assessor ID	CK03-0001
Client	CL2310006, Andrew Phillimore		

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

Orientation	Southwest
Property Tenure	ND
Transaction Type	6
Terrain Type	Suburban
1.0 Property Type	House, Detached
2.0 Number of Storeys	3
3.0 Date Built	2023
4.0 Sheltered Sides	0
5.0 Sunlight/Shade	Average or unknown
6.0 Thermal Mass Parameter	Precise calculation

7.0 Electricity Tariff	Standard
Smart electricity meter fitted	Yes
Smart gas meter fitted	Yes

7.0 Measurements	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Basement:	38.05 m	83.93 m ²	2.52 m
Ground floor:	43.01 m	90.47 m ²	2.75 m
1st Storey:	38.64 m	72.31 m ²	2.67 m

8.0 Living Area	58.98	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
	Typical External Wall	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.16	110.00	317.33	270.09	0.00	None	47.24	Calculate Wall Area

9.2 Internal Walls	Description	Construction	Kappa (kJ/m ² K)	Area (m ²)
	LGF Blockwork	Dense block, plasterboard on dabs	75.00	54.41
	LGF Studwork	Plasterboard on timber frame	9.00	92.04
	GF Blockwork	Dense block, plasterboard on dabs	75.00	51.65
	FF Blockwork	Dense block, plasterboard on dabs	75.00	17.09
	GF Studwork	Plasterboard on timber frame	9.00	91.18
	FF Studwork	Plasterboard on timber frame	9.00	87.29

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
	LGF Exposed Roof	External Flat Roof	Plasterboard, insulated flat roof	0.13	9.00	3.71	3.71	None	0.00	Enter Gross Area	0.00
	GF Exposed Roof (Living Room)	External Flat Roof	Plasterboard, insulated flat roof	0.13	9.00	5.39	5.39	None	0.00	Enter Gross Area	0.00
	GF Exposed Roof (Kitchen)	External Flat Roof	Plasterboard, insulated flat roof	0.13	9.00	5.08	5.08	None	0.00	Enter Gross Area	0.00
	GF Exposed Roof (Breakfast)	External Flat Roof	Plasterboard, insulated flat roof	0.13	9.00	7.69	7.69	None	0.00	Enter Gross Area	0.00
	FF Main Roof	External Slope Roof	Plasterboard, insulated slope	0.12	9.00	49.45	49.45	None	0.00	Enter Gross Area	0.00

Summary for Input Data



FF Parapet Roof	External Flat Roof	Plasterboard, insulated flat roof	0.13	9.00	22.86	22.86	None	0.00	Enter Gross Area	0.00
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10.2 Internal Ceilings

Description	Storey	Construction	Area (m ²)
LGF Internal Ceiling	Basement	Plasterboard ceiling, carpeted chipboard floor	80.23
GF Internal Ceiling	Lowest occupied	Plasterboard ceiling, carpeted chipboard floor	72.31

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)
Lower Ground Floor	Ground Floor - Solid	Basement	Slab on ground, screed over insulation	0.11	None	0.00	110.00	83.93
Ground Floor	Ground Floor - Solid	Lowest occupied	Slab on ground, screed over insulation	0.11	None	0.00	110.00	7.69

11.2 Internal Floors

Description	Storey Index	Construction	Kappa (kJ/m ² K)	Area (m ²)
GF Floor		Plasterboard ceiling, carpeted chipboard floor	9.00	82.79
FF Floor		Plasterboard ceiling, carpeted chipboard floor	9.00	72.31

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m ² K)
Typical Window	Manufacturer	Window	Triple Low-E Soft 0.05			0.57		1.00	1.00
Entrance Door	Manufacturer	Half Glazed Door	Triple Low-E Soft 0.05			0.57		0.80	1.00

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m ²)	Pitch
SE windows (LGF)	Typical Window	Typical External Wall	South East	8.94	
SE Windows (GF)	Typical Window	Typical External Wall	South East	11.41	
SE Windows (FF)	Typical Window	Typical External Wall	South East	6.48	
NE windows (GF & FF)	Typical Window	Typical External Wall	North East	1.87	
SW windows (GF)	Typical Window	Typical External Wall	South West	9.16	
SW windows (FF)	Typical Window	Typical External Wall	South West	0.83	
SW doors (GF)	Entrance Door	Typical External Wall	South West	1.89	
NW doors (GF)	Entrance Door	Typical External Wall	North West	1.89	
NW windows (GF)	Typical Window	Typical External Wall	North West	3.60	
NW windows (FF)	Typical Window	Typical External Wall	North West	1.18	

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
E1 Steel lintel with perforated steel base plate	Non Gov Approved Schemes	31.35	0.03	0.03 RCD E2-02	Yes
E3 Sill	Non Gov Approved Schemes	29.55	0.03	0.03 RCD E3-01	Yes
E4 Jamb	Non Gov Approved Schemes	81.68	0.02	0.02 RCD E4-01	Yes
E5 Ground floor (normal)	Non Gov Approved Schemes	45.99	0.16	0.16 RCD E5-12	No
E6 Intermediate floor within a dwelling	Non Gov Approved Schemes	73.70	0.00	0.00 RCD E6-01	No
E8 Balcony within a dwelling, wall insulation continuous	Table K1 - Default	17.66	0.10	0.10	No
E14 Flat roof	Table K1 - Default	51.95	0.16	0.16	No
E15 Flat roof with parapet	Table K1 - Default	13.66	0.30	0.30	No
E16 Corner (normal)	Non Gov Approved Schemes	43.19	0.05	0.05 RCD E16-01	No
E17 Corner (inverted – internal area greater than external area)	Non Gov Approved Schemes	10.93	-0.08	-0.08 RCD E17-01	No
E22 Basement floor	Table K1 - Default	25.98	0.22	0.22	No
E24 Eaves (insulation at ceiling level - inverted)	Table K1 - Default	18.78	0.15	0.15	No

Y-value W/m²K

18.0 Pressure Testing

Designed AP₅₀ m³/(h.m²) @ 50 Pa

Test Method

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present

Approved Installation

Mechanical Ventilation data Type

Type

MV Reference Number

Configuration

Manufacturer SFP

Summary for Input Data



Duct Type	Rigid
MVHR Efficiency	82.00
Wet Rooms	6
SFP from Installer Commissioning Certificate	No
MVHR System Location	Inside heated envelope (installed exclusively)
Duct Installation Specification	Level 1

20.0 Fans, Open Fireplaces, Flues

21.0 Fixed Cooling System	No
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22.0 Lighting

No Fixed Lighting	No
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Name	Efficacy	Power	Capacity	Count
LED Downlights (1 per room)	80.00	5	400	23

24.0 Main Heating 1

Description	Database	
Description	Air Souce Heat Pump	
Percentage of Heat	100.00	%
Database Ref. No.	104641	
Fuel Type	Electricity	
In Winter	313.76	
In Summer	178.07	
Model Name	Ecodan 8.5 kW	
Manufacturer	Mitsubishi Electric Europe B.V.	
System Type	Heat Pump	
Controls SAP Code	2205	
Is MHS Pumped	Pump in heated space	
Heating Pump Age	2013 or later	
Heat Emitter	Underfloor	
Underfloor Heating	Yes - Pipes in Wood	
Flow Temperature	Enter value	
Flow Temperature Value	45.00	

25.0 Main Heating 2	None
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26.0 Heat Networks	None
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Heat Source	Fuel Type	Heating Use	Efficiency	Percentage Of Heat	Heat	Heat Power Ratio	Electrical	Fuel Factor	Efficiency type
Heat source 1									
Heat source 2									
Heat source 3									
Heat source 4									
Heat source 5									

27.0 Secondary Heating

Secondary Heating	SAP table	
SAP Code	633	
SHS efficiency	60.00	%
HETAS Approved System	Yes	

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

Summary for Input Data



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
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28.3 Waste Water Heat Recovery System

29.0 Hot Water Cylinder

Hot Water Cylinder	
Cylinder Stat	Yes
Cylinder In Heated Space	Yes
Independent Time Control	Yes
Insulation Type	Measured Loss
Cylinder Volume	300.00 L
Loss	1.90 kWh/day
Pipes insulation	Fully insulated primary pipework
In Airing Cupboard	No

31.0 Thermal Store

None

32.0 Photovoltaic Unit

One Dwelling	
Export Capable Meter?	Yes
Connected To Dwelling	Yes
Diverter	Yes
Battery Capacity [kWh]	10.00

PV Cells kWp	Orientation	Elevation	Overshading	FGHRS	MCS Certificate	Overshading Factor	MCS Certificate Reference	Panel Manufacturer
6.48	South West	Horizontal			Yes	0.80		16no. Marley M10 405Wp panels

34.0 Small-scale Hydro

None

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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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
		A 96	A 99
		0	0
		0	0

Thermal Bridging



Property Reference	House	Issued on Date	19/12/2023
Assessment Reference	03_BWA specification	Prop Type Ref	Detached House
Property	Plot 4A, Trevarrick Road, St Austell, Cornwall, PL25 5JN		

SAP Rating	95 A	DER	1.06	TER	10.08
Environmental	99 A	% DER < TER			89.48
CO ₂ Emissions (t/year)	0.09	DFEE	36.52	TFEE	44.95
Compliance Check	See BREL	% DFEE < TFEE			18.75
% DPER < TPER	80.04	DPER	10.59	TPER	53.04

Assessor Details	Mr. Stuart Foster	Assessor ID	CK03-0001
Client	CL2310006, Andrew Phillimore		

	Junction details	Source Type	Psi (W/mK)	Length (m)	Result	Reference
External wall	E1 Steel lintel with perforated steel base plate	Non Gov Approved Schemes	0.028	31.35	0.88	RCD E2-02
External wall	E3 Sill	Non Gov Approved Schemes	0.027	29.55	0.80	RCD E3-01
External wall	E4 Jamb	Non Gov Approved Schemes	0.021	81.68	1.72	RCD E4-01
External wall	E5 Ground floor (normal)	Non Gov Approved Schemes	0.161	45.99	7.40	RCD E5-12
External wall	E6 Intermediate floor within a dwelling	Non Gov Approved Schemes	0.002	73.70	0.15	RCD E6-01
External wall	E8 Balcony within a dwelling, wall insulation continuous	Table K1 - Default	0.100	17.66	1.77	
External wall	E14 Flat roof	Table K1 - Default	0.160	51.95	8.31	
External wall	E15 Flat roof with parapet	Table K1 - Default	0.300	13.66	4.10	
External wall	E16 Corner (normal)	Non Gov Approved Schemes	0.048	43.19	2.07	RCD E16-01
External wall	E17 Corner (inverted – internal area greater than external area)	Non Gov Approved Schemes	-0.081	10.93	-0.89	RCD E17-01
External wall	E22 Basement floor	Table K1 - Default	0.220	25.98	5.72	
External wall	E24 Eaves (insulation at ceiling level - inverted)	Table K1 - Default	0.150	18.78	2.82	

Total: 444.42 W/mK:
 Y-Value: 0.07 W/m²K:

Overview Report

Dwelling Address	Plot 4A, Trevarrick Road, St Austell, Cornwall, PL25 5JN
Report Date	19/12/2023
Property Type	House, Detached
Floor Area [m ²]	247

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

Energy Rating

The current energy rating represents the overall energy efficiency of the dwelling. The potential energy rating is the overall energy rating of the dwelling if all the recommend measures provided on the next page have been installed. A higher score represents a more energy efficient dwelling with lower fuel bills.

Most energy efficient - lower running costs

CURRENT

POTENTIAL

(92 plus)

A

95

95

(81-91)

B

(69-80)

C

(55-68)

D

(39-54)

E

(21-38)

F

(1-20)

G

Least energy efficient - higher running costs

Breakdown of property's energy performance

Each feature is assessed as one of the following:



Feature	Description	Energy Performance
Walls	Average thermal transmittance 0.16 W/m ² K	Very Good
Roof	Average thermal transmittance 0.12 W/m ² K	Very Good
Floor	Average thermal transmittance 0.11 W/m ² K	Very Good
Windows	High performance glazing	Very Good
Main heating	Air source heat pump, underfloor, electric	Very Good
Main heating controls	Programmer and at least one room thermostat	Good
Secondary heating	Room heaters, working	
Hot water	From main system	Average
Lighting	Good lighting efficiency	Good
Air tightness	Air permeability [50] = 2.0 l/m ³ .m ² (assumed)	Very Good

Primary Energy use

The primary energy use for this property per year is 4 kilowatt hour (kWh) per square metre

Estimated CO₂ emissions of the dwelling





The estimated CO₂ emissions provides an indication of the dwelling's impact on the environment in terms of carbon dioxide emissions; the higher the rating the less impact it has on the environment.

The estimated CO emissions for this dwellings is: **0.1** per year

With the recommended measures the potential CO emissions could be: **0.0** per year

Recommendations

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

Recommended measure	Typical Yearly Saving	Potential Rating after measure installed	Cumulative Savings per year	Cumulative Potential Rating
Solar water heating				
Photovoltaic			£171	

Estimated energy use and potential savings

Estimated energy cost for this property over a year

£103

Over a year you could save

£0

The estimated cost and savings show how much the average household would spend on this property for heating, lighting and hot water. It is not based on how energy is used by the people living at the property.

Contacting the assessor and the accreditation scheme

Assessor contact details

Assessor name	Mr. Stuart Foster
Assessor's accreditation number	
Email Address	

Accreditation scheme contact detail

Accreditation scheme	
Telephone	
Email Address	

Assessment details

Related party disclosure	
Date of assessment	19/12/23
Date of certificate	19/12/23
Type of assessment	SAP, new dwelling

OVERVIEW