

Building Regulations England Part L (BREL) Compliance Report

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

Date: Thu 08 Jan 2026 16:42:55

Project Information			
Assessed By	Matthew Carter	Building Type	House, Detached
OCDEA Registration	EES/003584	Assessment Date	2026-01-08

Dwelling Details			
Assessment Type	As designed	Total Floor Area	113 m ²
Site Reference	01775	Plot Reference	00001
Address	9 Unit 3 Circuit Lane, Reading , RG30 5HB		

Client Details	
Name	Simon Knight
Company	KNHD Ltd
Address	The Oak House, 5 Carew Close , Tilehurst , Reading , RG31 6XZ

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	13.23 kgCO ₂ /m ²		
Dwelling carbon dioxide emission rate	4.0 kgCO ₂ /m ²		OK
1b Target primary energy rate and dwelling primary energy			
Target primary energy	69.51 kWh _{PE} /m ²		
Dwelling primary energy	41.44 kWh _{PE} /m ²		OK
1c Target fabric energy efficiency and dwelling fabric energy efficiency			
Target fabric energy efficiency	52.2 kWh/m ²		
Dwelling fabric energy efficiency	52.0 kWh/m ²		OK

2a Fabric U-values				
Element	Maximum permitted average U-Value [W/m ² K]	Dwelling average U-Value [W/m ² K]	Element with highest individual U-Value	
External walls	0.26	0.17	Walls (1) (0.17)	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	New (0.11)	OK
Roofs	0.16	0.11	Roof (2) (0.14)	OK
Windows, doors, and roof windows	1.6	1.23	Opening (1.4)	OK
Rooflights	2.2	N/A	N/A	N/A

2b Envelope elements (better than typically expected values are flagged with a subsequent (!))			
Name	Net area [m ²]	U-Value [W/m ² K]	
Exposed wall: Walls (1)	172.856125	0.17	
Ground floor: New, New	56.75	0.11	
Exposed roof: Roof (1)	52.9	0.11	
Exposed roof: Roof (2)	3.342	0.14	

2c Openings (better than typically expected values are flagged with a subsequent (!))				
Name	Area [m ²]	Orientation	Frame factor	U-Value [W/m ² K]
Opening, Door	1.911	West	N/A	1.4
Opening, Windows	0.819	West	0.7	1.2
Opening, Windows	0.819	West	0.7	1.2
Opening, Windows	1.535625	West	0.7	1.2
Opening, Windows	0.770625	West	0.7	1.2
Opening, Windows	0.770625	West	0.7	1.2
Opening, Windows	2.172	West	0.7	1.2
Opening, Roof windows	0.888	West	0.7	1.2
Opening, Windows	12.376	North	0.7	1.2
Opening, Windows	0.819	North	0.7	1.2
Opening, Windows	0.819	North	0.7	1.2
Opening, Windows	0.6165	North	0.7	1.2
Opening, Door	1.9887	North	N/A	1.4

Name	Area [m ²]	Orientation	Frame factor	U-Value [W/m ² K]
Opening, Windows	0.819	South	0.7	1.2
Opening, Door	1.9887	East	N/A	1.4
Opening, Windows	4.5087	East	0.7	1.2
Opening, Windows	1.5504	East	0.7	1.2
Opening, Windows	1.53	East	0.7	1.2
Opening, Windows	1.53	East	0.7	1.2

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

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

Main element	Junction detail	Source	Psi value [W/mK]	Drawing / reference
External wall	E2: Other lintels (including other steel lintels)	Calculated by person with suitable expertise	0.234	RCD
External wall	E3: Sill	Calculated by person with suitable expertise	0.023 (!)	RCD
External wall	E4: Jamb	Calculated by person with suitable expertise	0.018 (!)	RCD
External wall	E5: Ground floor (normal)	Calculated by person with suitable expertise	0.068	RCD
External wall	E6: Intermediate floor within a dwelling	Calculated by person with suitable expertise	0.001 (!)	RCD
External wall	E10: Eaves (insulation at ceiling level)	Calculated by person with suitable expertise	0.055	RCD
External wall	E11: Eaves (insulation at rafter level)	Calculated by person with suitable expertise	0.018 (!)	RCD
External wall	E12: Gable (insulation at ceiling level)	Calculated by person with suitable expertise	0.037 (!)	RCD
External wall	E13: Gable (insulation at rafter level)	Calculated by person with suitable expertise	0.039 (!)	RCD
External wall	E16: Corner (normal)	Calculated by person with suitable expertise	0.04	RCD
External wall	E17: Corner (inverted - internal area greater than external area)	Calculated by person with suitable expertise	-0.082	RCD
Roof	R1: Head of roof window	SAP table default	0.24	
Roof	R2: Sill of roof window	SAP table default	0.24	
Roof	R3: Jamb of roof window	SAP table default	0.24	
Roof	R11: Upstands or kerbs of rooflights	SAP table default	0.24	

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

Maximum permitted air permeability at 50Pa	8 m ³ /hm ²	
Dwelling air permeability at 50Pa	5 m ³ /hm ² , Design value	OK
Air permeability test certificate reference		

4 Space heating

Main heating system 1: Heat pump with radiators or underfloor heating - Electricity

Efficiency	298.6%
Emitter type	Both radiators and underfloor
Flow temperature	45°C
System type	Heat Pump
Manufacturer	Mitsubishi Electric Europe B.V.
Model	Ecodan 6.0 kW
Commissioning	

Secondary heating system: N/A

Fuel	N/A
Efficiency	N/A
Commissioning	

5 Hot water		
Cylinder/store - type: Cylinder		
Capacity	200 litres	
Declared heat loss	1.86 kWh/day	
Primary pipework insulated	Yes	
Manufacturer		
Model		
Commissioning		
Waste water heat recovery system 1 - type: N/A		
Efficiency		
Manufacturer		
Model		
6 Controls		
Main heating 1 - type: Time and temperature zone control by arrangement of plumbing and electrical services		
Function		
Ecodesign class		
Manufacturer		
Model		
Water heating - type: Cylinder thermostat and HW separately timed		
Manufacturer		
Model		
7 Lighting		
Minimum permitted light source efficacy	75 lm/W	
Lowest light source efficacy	84 lm/W	OK
External lights control	N/A	
8 Mechanical ventilation		
System type: N/A		
Maximum permitted specific fan power	N/A	
Specific fan power	N/A	N/A
Minimum permitted heat recovery efficiency	N/A	
Heat recovery efficiency	N/A	N/A
Manufacturer/Model		
Commissioning		
9 Local generation		
N/A		
10 Heat networks		
N/A		
11 Supporting documentary evidence		
N/A		
12 Declarations		
a. Assessor Declaration		
This declaration by the assessor is confirmation that the contents of this BREL Compliance Report are a true and accurate reflection based upon the design information submitted for this dwelling for the purpose of carrying out the "As designed" assessment, and that the supporting documentary evidence (SAP Conventions, Appendix 1 (documentary evidence) schedules the minimum documentary evidence required) has been reviewed in the course of preparing this BREL Compliance Report.		
Signed:	Assessor ID:	
Name:	Date:	
b. Client Declaration		
N/A		

Full SAP Calculation Printout



Plot Reference	01775			Issued on Date	08/01/2026
Assessment Reference	00001	Plot Type Ref			
Plot Address	Unit 3, 9 , Circuit Lane , Reading , RG30 5HB			SAP Version	10.2
SAP Rating	82 B	DER	4.00	TER	13.23
Environmental	96 A	% DER < TER			69.77
CO ₂ Emissions (t/year)	0.4	DFEE	52.02	TFEE	52.17
Compliance Check	See BREL	% DFEE < TFEE			0.29
% DPER < TPER	40.39	DPER	41.44	TPER	69.51
Assessor Details	Mr. Matthew Carter			Assessor ID	7869-0001
Client	Simon Knight, Simon Knight				

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	56.7500 (1b)	x 2.4000 (2b)	= 136.2000 (1b) - (3b)
First floor	55.8700 (1c)	x 2.8400 (2c)	= 158.6708 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	112.6200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 294.8708 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	5 * 10 = 50.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	Air changes per hour 50.0000 / (5) = 0.1696 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4196 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3881 (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	0.4948	0.4851	0.4754	0.4269	0.4172	0.3687	0.3687	0.3590	0.3881	0.4172	0.4366	0.4560 (22b)
Effective ac	0.6224	0.6177	0.6130	0.5911	0.5870	0.5680	0.5680	0.5644	0.5753	0.5870	0.5953	0.6040 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Door			5.8900	1.4000	8.2460		(26)
Windows			31.4600	1.1450	36.0229		(27)
Roof windows			0.8900	1.1450	1.0191		(27a)
New			56.7500	0.1100	6.2425	75.0000	4256.2500 (28a)
New	210.2000	37.3500	172.8500	0.1700	29.3845	190.0000	32841.5000 (29a)
Loft	52.9000		52.9000	0.1100	5.8190	9.0000	476.1000 (30)
Slope	4.2300	0.8900	3.3400	0.1400	0.4676	9.0000	30.0600 (30)
Total net area of external elements A _{um} (A, m ²)			324.0800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	87.2016		(33)
Main dwelling							
Internal Wall 1			70.4600			75.0000	5284.5000 (32c)
Internal Wall 2			129.5000			9.0000	1165.5000 (32c)
Internal Floor 2			55.8700			18.0000	1005.6600 (32d)
Internal Ceiling 1			56.7500			9.0000	510.7500 (32e)
Heat capacity C _m = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	45570.3200 (34)
Thermal mass parameter (TMP = C _m / TFA) in kJ/m ² K							404.6379 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	

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E2 Other lintels (including other steel lintels)	19.1000	0.2340	4.4694
E3 Sill	15.2500	0.0230	0.3508
E4 Jamb	45.6500	0.0180	0.8217
E5 Ground floor (normal)	31.1100	0.0680	2.1155
E6 Intermediate floor within a dwelling	30.6800	0.0010	0.0307
E10 Eaves (insulation at ceiling level)	6.0500	0.0550	0.3327
E11 Eaves (insulation at rafter level)	6.0500	0.0180	0.1089
E12 Gable (insulation at ceiling level)	17.3600	0.0370	0.6423
E13 Gable (insulation at rafter level)	1.4000	0.0390	0.0546
E16 Corner (normal)	28.0000	0.0400	1.1200
E17 Corner (inverted - internal area greater than external area)	7.2000	-0.0820	-0.5904
R1 Head of roof window	0.7500	0.2400	0.1800
R2 Sill of roof window	0.7500	0.2400	0.1800
R3 Jamb of roof window	2.3600	0.2400	0.5664
R11 Upstands or kerbs of rooflights	3.8600	0.2400	0.9264
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			11.3090 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	98.5106 (37)

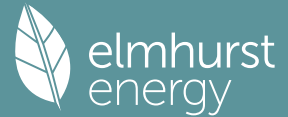
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	60.5666	60.1040	59.6506	57.5208	57.1224	55.2674	55.2674	54.9239	55.9819	57.1224	57.9285	58.7712	(38)
Average = Sum(39)m / 12 =	159.0772	158.6146	158.1612	156.0314	155.6329	153.7780	153.7780	153.4345	154.4925	155.6329	156.4390	157.2818	(39)
												156.0295	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.4125	1.4084	1.4044	1.3855	1.3819	1.3655	1.3655	1.3624	1.3718	1.3819	1.3891	1.3966	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)													
Assumed occupancy													2.8297 (42)
Hot water usage for mixer showers													
	71.6641	70.5871	69.0178	66.0151	63.7992	61.3280	59.9234	61.4809	63.1882	65.8415	68.9086	71.3895	(42a)
Hot water usage for baths													
	30.9411	30.4816	29.8345	28.6414	27.7480	26.7573	26.2222	26.8648	27.5644	28.6245	29.8422	30.8365	(42b)
Hot water usage for other uses													
	43.6087	42.0229	40.4371	38.8514	37.2656	35.6798	35.6798	37.2656	38.8514	40.4371	42.0229	43.6087	(42c)
Average daily hot water use (litres/day)													134.4034 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	146.2139	143.0916	139.2894	133.5078	128.8127	123.7652	121.8254	125.6113	129.6040	134.9030	140.7737	145.8347	(44)
Energy conte	231.5671	203.7606	214.0826	182.7655	173.4067	152.1837	147.3373	155.5330	159.8147	183.0622	200.5579	228.3419	(45)
Energy content (annual)													
Distribution loss (46)m = 0.15 x (45)m													
	34.7351	30.5641	32.1124	27.4148	26.0110	22.8276	22.1006	23.3299	23.9722	27.4593	30.0837	34.2513	(46)
Water storage loss (or HIU loss):													
Store volume													200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.8600 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													1.0044 (55)
Total storage loss													
	31.1364	28.1232	31.1364	30.1320	31.1364	30.1320	31.1364	31.1364	30.1320	31.1364	30.1320	31.1364	(56)
If cylinder contains dedicated solar storage													
	31.1364	28.1232	31.1364	30.1320	31.1364	30.1320	31.1364	31.1364	30.1320	31.1364	30.1320	31.1364	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	285.9659	252.8950	268.4814	235.4095	227.8055	204.8277	201.7361	209.9318	212.4587	237.4610	253.2019	282.7407	(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													
	285.9659	252.8950	268.4814	235.4095	227.8055	204.8277	201.7361	209.9318	212.4587	237.4610	253.2019	282.7407	(64)
12Total per year (kWh/year)													
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =													0.0000 (64a)
Heat gains from water heating, kWh/month													
	120.5151	107.0579	114.7015	102.8847	101.1768	92.7163	92.5087	95.2338	95.2536	104.3872	108.8007	119.4427	(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	141.4836	141.4836	141.4836	141.4836	141.4836	141.4836	141.4836	141.4836	141.4836	141.4836	141.4836	141.4836	(66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	138.8410	153.7168	138.8410	143.4690	138.8410	143.4690	138.8410	138.8410	143.4690	138.8410	143.4690	138.8410	(67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	275.2678	278.1242	270.9261	255.6022	236.2586	218.0783	205.9328	203.0764	210.2745	225.5983	244.9419	263.1222	(68)
Pumps, fans	37.1484	37.1484	37.1484	37.1484	37.1484	37.1484	37.1484	37.1484	37.1484	37.1484	37.1484	37.1484	(69)
Losses e.g. evaporation (negative values) (Table 5)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Water heating gains (Table 5)	-113.1868	-113.1868	-113.1868	-113.1868	-113.1868	-113.1868	-113.1868	-113.1868	-113.1868	-113.1868	-113.1868	-113.1868	(71)
Total internal gains	161.9826	159.3124	154.1687	142.8955	135.9903	128.7726	124.3396	128.0024	132.2966	140.3054	151.1121	160.5413	(72)
	641.5365	656.5984	629.3808	607.4118	576.5349	555.7650	534.5585	535.3648	551.4852	570.1897	604.9681	627.9496	(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												

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North			14.6300		10.6334		0.6300		0.7000		0.7700		47.5432 (74)
East			9.1200		19.6403		0.6300		0.7000		0.7700		54.7412 (76)
South			0.8200		46.7521		0.6300		0.7000		0.7700		11.7162 (78)
West			6.8900		19.6403		0.6300		0.7000		0.7700		41.3560 (80)
West			0.8900		25.9973		0.6300		0.7000		1.0000		9.1833 (82)

Solar gains	164.5398	316.4170	519.7692	774.5798	975.9169	1013.6108	958.8190	803.6868	608.2419	374.0069	203.8854	136.2883 (83)
Total gains	806.0763	973.0154	1149.1500	1381.9916	1552.4518	1569.3758	1493.3775	1339.0516	1159.7270	944.1966	808.8536	764.2379 (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	79.5741	79.8062	80.0350	81.1274	81.3351	82.3162	82.3162	82.5005	81.9355	81.3351	80.9160	80.4824
alpha	6.3049	6.3204	6.3357	6.4085	6.4223	6.4877	6.4877	6.5000	6.4624	6.4223	6.3944	6.3655
util living area												
	0.9996	0.9986	0.9937	0.9597	0.8331	0.6154	0.4516	0.5232	0.8269	0.9867	0.9989	0.9997 (86)
Living	20.0910	20.2156	20.4156	20.6898	20.8798	20.9435	20.9511	20.9498	20.9020	20.6314	20.3148	20.0770
Non living	18.7054	18.8675	19.1245	19.4714	19.6685	19.7255	19.7283	19.7305	19.6991	19.4115	19.0070	18.6975
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	20.5350	20.2156	20.4156	20.6898	20.8798	20.9435	20.9511	20.9498	20.9020	20.6314	20.3148	20.2061 (87)
Th 2	19.7538	19.7569	19.7600	19.7745	19.7772	19.7899	19.7899	19.7923	19.7850	19.7772	19.7717	19.7660 (88)
util rest of house												
	0.9994	0.9978	0.9899	0.9363	0.7595	0.5054	0.3283	0.3882	0.7225	0.9751	0.9981	0.9996 (89)
MIT 2	19.3358	18.8675	19.1245	19.4714	19.6685	19.7255	19.7283	19.7305	19.6991	19.4115	19.0070	18.8900 (90)
Living area fraction										fLA = Living area / (4) =		0.1317 (91)
MIT	19.4937	19.0450	19.2945	19.6318	19.8280	19.8859	19.8893	19.8911	19.8575	19.5721	19.1792	19.0633 (92)
Temperature adjustment												0.0000
adjusted MIT	19.4937	19.0450	19.2945	19.6318	19.8280	19.8859	19.8893	19.8911	19.8575	19.5721	19.1792	19.0633 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9993	0.9971	0.9878	0.9327	0.7630	0.5144	0.3385	0.3994	0.7296	0.9722	0.9975	0.9995 (94)
Useful gains	805.5472	970.2040	1135.1568	1289.0390	1184.5052	807.3280	505.5294	534.8174	846.1868	917.9873	806.8136	763.8205 (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												
	2416.9736	2243.6052	2023.5906	1674.5010	1264.9880	812.8568	505.8274	535.6511	889.4897	1396.3564	1889.6621	2337.7291 (97)
Space heating kWh												
	1198.9012	855.7256	660.9947	277.5326	59.8792	0.0000	0.0000	0.0000	0.0000	355.9067	779.6509	1170.9880 (98a)
Space heating requirement - total per year (kWh/year)												5359.5790
Solar heating kWh												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)												0.0000
Space heating kWh												
	1198.9012	855.7256	660.9947	277.5326	59.8792	0.0000	0.0000	0.0000	0.0000	355.9067	779.6509	1170.9880 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												5359.5790
Space heating per m2										(98c) / (4) =		47.5899 (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 %)												298.5589 (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												
	1198.9012	855.7256	660.9947	277.5326	59.8792	0.0000	0.0000	0.0000	0.0000	355.9067	779.6509	1170.9880 (98)
Space heating efficiency (main heating system 1)												
	298.5589	298.5589	298.5589	298.5589	298.5589	0.0000	0.0000	0.0000	0.0000	298.5589	298.5589	298.5589 (210)
Space heating fuel (main heating system)												
	401.5628	286.6187	221.3951	92.9574	20.0561	0.0000	0.0000	0.0000	0.0000	119.2082	261.1381	392.2135 (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												
	285.9659	252.8950	268.4814	235.4095	227.8055	204.8277	201.7361	209.9318	212.4587	237.4610	253.2019	282.7407 (64)
Efficiency of water heater (217)m												295.0479 (216)
	295.0479	295.0479	295.0479	295.0479	295.0479	295.0479	295.0479	295.0479	295.0479	295.0479	295.0479	295.0479 (217)
Fuel for water heating, kWh/month												
	96.9218	85.7132	90.9959	79.7869	77.2097	69.4218	68.3740	71.1518	72.0082	80.4822	85.8172	95.8287 (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 (217)m												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting												
	28.3711	22.7603	20.4932	15.0142	11.5974	9.4752	10.5795	13.7516	17.8620	23.4360	26.4709	29.1596 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235a)m												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235c)m												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity) (233b)m												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234b)m												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235b)m												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												

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(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												1795.1499	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												295.0479	
Water heating fuel used												973.7114	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000	(231)
Electricity for lighting (calculated in Appendix L)												228.9709	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												2997.8321	(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	1795.1499	0.1564	280.7025	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	973.7114	0.1409	137.2341	(264)
Space and water heating			417.9366	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	228.9709	0.1443	33.0476	(268)
Total CO2, kg/year			450.9842	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.0000	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1795.1499	1.5789	2834.3357	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	973.7114	1.5211	1481.1553	(278)
Space and water heating			4315.4910	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	228.9709	1.5338	351.2032	(282)
Total Primary energy kWh/year			4666.6942	(286)
Dwelling Primary energy Rate (DPER)			41.4400	(287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)	
Main dwelling				
Ground floor	56.7500 (1b)	x 2.4000 (2b)	= 136.2000	(1b) - (3b)
First floor	55.8700 (1c)	x 2.8400 (2c)	= 158.6708	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	112.6200			(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	294.8708 (5)

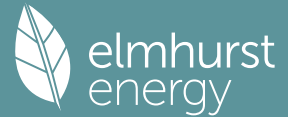
2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	4 * 10 =	40.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1357 (8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3857	(18)
Number of sides sheltered		1	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =		0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =		0.3567 (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)

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Adj infilt rate	0.4548	0.4459	0.4370	0.3924	0.3835	0.3389	0.3389	0.3300	0.3567	0.3835	0.4013	0.4192 (22b)
Effective ac	0.6034	0.5994	0.5955	0.5770	0.5735	0.5574	0.5574	0.5544	0.5636	0.5735	0.5805	0.5878 (25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K
TER Opaque door			5.8900	1.0000	5.8900		(26)
TER Opening Type			21.6600	1.1450	24.8015		(27)
TER Roof Window			0.6100	1.1450	0.8632		(27a)
New			56.7500	0.1300	7.3775		(28a)
New	210.2000	27.5500	182.6500	0.1800	32.8770		(29a)
Loft	52.9000		52.9000	0.1100	5.8190		(30)
Slope	4.2300	0.6100	3.6200	0.1100	0.3982		(30)
Total net area of external elements Aum(A, m2)			324.0800				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		78.0264		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							404.6379 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				19.1000	0.0500	0.9550	
E3 Sill				15.2500	0.0500	0.7625	
E4 Jamb				45.6500	0.0500	2.2825	
E5 Ground floor (normal)				31.1100	0.1600	4.9776	
E6 Intermediate floor within a dwelling				30.6800	0.0000	0.0000	
E10 Eaves (insulation at ceiling level)				6.0500	0.0600	0.3630	
E11 Eaves (insulation at rafter level)				6.0500	0.0400	0.2420	
E12 Gable (insulation at ceiling level)				17.3600	0.0600	1.0416	
E13 Gable (insulation at rafter level)				1.4000	0.0800	0.1120	
E16 Corner (normal)				28.0000	0.0900	2.5200	
E17 Corner (inverted - internal area greater than external area)				7.2000	-0.0900	-0.6480	
R1 Head of roof window				0.7500	0.0800	0.0600	
R2 Sill of roof window				0.7500	0.0600	0.0450	
R3 Jamb of roof window				2.3600	0.0800	0.1888	
R11 Upstands or kerbs of rooflights				3.8600	0.0800	0.3088	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							13.2108 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	91.2372 (37)

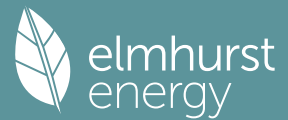
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.8297 (42)
Hot water usage for mixer showers	71.6641	70.5871	69.0178	66.0151	63.7992	61.3280	59.9234	61.4809	63.1882	65.8415	68.9086	71.3895	(42a)
Hot water usage for baths	30.9411	30.4816	29.8345	28.6414	27.7480	26.7573	26.2222	26.8648	27.5644	28.6245	29.8422	30.8365	(42b)
Hot water usage for other uses	43.6087	42.0229	40.4371	38.8514	37.2656	35.6798	35.6798	37.2656	38.8514	40.4371	42.0229	43.6087	(42c)
Average daily hot water use (litres/day)												134.4034	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy content (annual)	146.2139	143.0916	139.2894	133.5078	128.8127	123.7652	121.8254	125.6113	129.6040	134.9030	140.7737	145.8347	(44)
Distribution loss (46)m = 0.15 x (45)m	231.5671	203.7606	214.0826	182.7655	173.4067	152.1837	147.3373	155.5330	159.8147	183.0622	200.5579	228.3419	(45)
Water storage loss (or HIU loss):													
Store volume	34.7351	30.5641	32.1124	27.4148	26.0110	22.8276	22.1006	23.3299	23.9722	27.4593	30.0837	34.2513	(46)
a) If manufacturer declared loss factor is known (kWh/day):													
Temperature factor from Table 2b													200.0000 (47)
Enter (49) or (54) in (55)													1.6525 (48)
Total storage loss													0.5400 (49)
If cylinder contains dedicated solar storage													0.8924 (55)
Primary loss	27.6637	24.9865	27.6637	26.7713	27.6637	26.7713	27.6637	27.6637	26.7713	27.6637	26.7713	27.6637	(56)
Combi loss	27.6637	24.9865	27.6637	26.7713	27.6637	26.7713	27.6637	27.6637	26.7713	27.6637	26.7713	27.6637	(57)
Total heat required for water heating calculated for each month	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)
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	(61)
PV diverter	282.4931	249.7583	265.0087	232.0488	224.3328	201.4670	198.2634	206.4591	209.0980	233.9882	249.8412	279.2680	(62)
Solar input	-32.7618	-28.9748	-30.3408	-25.1234	-23.4141	-20.0356	-18.7802	-19.9708	-20.7296	-24.4379	-27.6852	-32.1551	(63a)
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	(63b)
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	(63c)
12Total 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	(63d)
Electric shower(s)	249.7313	220.7835	234.6679	206.9254	200.9187	181.4314	179.4832	186.4882	188.3684	209.5503	222.1561	247.1129	(64)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												2527.6173	(64)
Heat gains from water heating, kWh/month												2528	(64)
	117.7369	104.5486	111.9233	100.1962	98.3986	90.0277	89.7305	92.4556	92.5650	101.6090	106.1122	116.6645	(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
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(66)m	141.4836	141.4836	141.4836	141.4836	141.4836	141.4836	141.4836	141.4836	141.4836	141.4836	141.4836	141.4836	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	139.9043	154.8940	139.9043	144.5678	139.9043	144.5678	139.9043	139.9043	144.5678	139.9043	144.5678	139.9043	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	275.2678	278.1242	270.9261	255.6022	236.2586	218.0783	205.9328	203.0764	210.2745	225.5983	244.9419	263.1222	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.1484	37.1484	37.1484	37.1484	37.1484	37.1484	37.1484	37.1484	37.1484	37.1484	37.1484	37.1484	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-113.1868	-113.1868	-113.1868	-113.1868	-113.1868	-113.1868	-113.1868	-113.1868	-113.1868	-113.1868	-113.1868	-113.1868	(71)
Water heating gains (Table 5)	158.2485	155.5782	150.4346	139.1613	132.2562	125.0385	120.6055	124.2682	128.5625	136.5713	147.3780	156.8072	(72)
Total internal gains	641.8657	657.0415	629.7101	607.7764	576.8641	553.1297	531.8877	532.6940	548.8498	570.5190	605.3328	628.2788	(73)

6. Solar gains

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

North					10.0800	10.6334	0.6300	0.7000	0.7700	32.7570 (74)		
East					6.2800	19.6403	0.6300	0.7000	0.7700	37.6946 (76)		
South					0.5600	46.7521	0.6300	0.7000	0.7700	8.0013 (78)		
West					4.7400	19.6403	0.6300	0.7000	0.7700	28.4510 (80)		
West					0.6100	25.9973	0.6300	0.7000	1.0000	6.2942 (82)		

Solar gains	113.1981	217.7001	357.6481	533.0382	671.6385	697.5996	659.8822	553.0865	418.5443	257.3331	140.2694	93.7601 (83)
Total gains	755.0637	874.7417	987.3582	1140.8147	1248.5027	1250.7292	1191.7699	1085.7805	967.3941	827.8521	745.6022	722.0389 (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	84.4143	84.6349	84.8522	85.8882	86.0848	87.0122	87.0122	87.1861	86.6526	86.0848	85.6880	85.2769	
alpha	6.6276	6.6423	6.6568	6.7259	6.7390	6.8008	6.8008	6.8124	6.7768	6.7390	6.7125	6.6851	
util living area	0.9998	0.9992	0.9971	0.9816	0.9068	0.7160	0.5334	0.6063	0.8886	0.9926	0.9993	0.9998	(86)
MIT	19.9060	20.0403	20.2623	20.5839	20.8524	20.9777	20.9973	20.9940	20.9068	20.5561	20.1799	19.8901	(87)
Th 2	19.8162	19.8189	19.8216	19.8340	19.8364	19.8473	19.8473	19.8493	19.8431	19.8364	19.8317	19.8267	(88)
util rest of house	0.9996	0.9988	0.9952	0.9693	0.8515	0.6019	0.3960	0.4600	0.8018	0.9858	0.9988	0.9997	(89)
MIT 2	18.5548	18.7290	19.0147	19.4271	19.7291	19.8388	19.8469	19.8482	19.7920	19.4000	18.9178	18.5425	(90)
Living area fraction	18.7327	18.9017	19.1789	19.5794	19.8770	19.9887	19.9983	19.9991	19.9388	19.5523	19.0840	18.7199	(91)
MIT	18.7327	18.9017	19.1789	19.5794	19.8770	19.9887	19.9983	19.9991	19.9388	19.5523	19.0840	18.7199	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.7327	18.9017	19.1789	19.5794	19.8770	19.9887	19.9983	19.9991	19.9388	19.5523	19.0840	18.7199	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9994	0.9982	0.9936	0.9655	0.8538	0.6168	0.4142	0.4795	0.8105	0.9832	0.9983	0.9996	(94)
Useful gains	754.6058	873.1955	981.0846	1101.5101	1066.0012	771.4141	493.6580	520.6781	784.0990	813.9791	744.2999	721.7180	(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	2164.2672	2094.1602	1891.4696	1573.9604	1202.3917	783.9459	494.3875	522.5434	852.9517	1316.3957	1770.3585	2155.3258	(97)
Space heating kWh	1048.7881	820.4883	677.3264	340.1642	101.4746	0.0000	0.0000	0.0000	0.0000	373.7980	738.7622	1066.6042	(98a)
Space heating requirement - total per year (kWh/year)												5167.4059	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	1048.7881	820.4883	677.3264	340.1642	101.4746	0.0000	0.0000	0.0000	0.0000	373.7980	738.7622	1066.6042	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												5167.4059	
Space heating per m2										(98c) / (4) =		45.8836	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													92.3000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	1048.7881	820.4883	677.3264	340.1642	101.4746	0.0000	0.0000	0.0000	0.0000	373.7980	738.7622	1066.6042	(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)	1136.2818	888.9364	733.8315	368.5419	109.9399	0.0000	0.0000	0.0000	0.0000	404.9816	800.3924	1155.5842	(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	249.7313	220.7835	234.6679	206.9254	200.9187	181.4314	179.4832	186.4882	188.3684	209.5503	222.1561	247.1129	(64)
Efficiency of water heater	86.9148	86.7261	86.2957	85.1670	82.6096	79.8000	79.8000	79.8000	79.8000	85.3425	86.5434	86.9553	(216)
Fuel for water heating, kWh/month													(217)

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Space cooling fuel requirement	287.3289	254.5756	271.9347	242.9644	243.2147	227.3576	224.9163	233.6945	236.0506	245.5405	256.6989	284.1838	(219)
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	29.0694	23.3205	20.9975	15.3837	11.8828	9.7084	10.8399	14.0901	18.3017	24.0128	27.1224	29.8773	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-51.1471	-71.1341	-100.8710	-111.8099	-119.1848	-110.6905	-109.2400	-103.7435	-93.9220	-80.4942	-55.8495	-44.3278	(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	-31.9461	-66.8277	-132.1667	-197.5928	-260.4356	-261.4381	-258.4369	-219.2651	-161.2592	-95.3557	-42.5752	-25.2976	(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												5598.4896	(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												3008.4606	(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)												234.6063	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-2805.0109	(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												6122.5456	(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	5598.4896	0.2100	1175.6828 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3008.4606	0.2100	631.7767 (264)
Space and water heating			1807.4595 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	234.6063	0.1443	33.8609 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1052.4145	0.1349	-141.9651
PV Unit electricity exported	-1752.5965	0.1260	-220.8725
Total			-362.8375 (269)
Total CO2, kg/year			1490.4122 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			13.2300 (273)

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

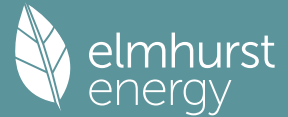
	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	5598.4896	1.1300	6326.2933 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3008.4606	1.1300	3399.5604 (278)
Space and water heating			9725.8537 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	234.6063	1.5338	359.8470 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1052.4145	1.4986	-1577.1116
PV Unit electricity exported	-1752.5965	0.4626	-810.7633
Total			-2387.8748 (283)
Total Primary energy kWh/year			7827.9266 (286)
Target Primary Energy Rate (TPER)			69.5100 (287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	56.7500 (1b)	x 2.4000 (2b)	= 136.2000 (1b) - (3b)
First floor	55.8700 (1c)	x 2.8400 (2c)	= 158.6708 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	112.6200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 294.8708 (5)

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2. Ventilation rate

											m3 per hour	
Number of open chimneys											0 * 80 =	0.0000 (6a)
Number of open flues											0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire											0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler											0 * 20 =	0.0000 (6d)
Number of flues attached to other heater											0 * 35 =	0.0000 (6e)
Number of blocked chimneys											0 * 20 =	0.0000 (6f)
Number of intermittent extract fans											4 * 10 =	40.0000 (7a)
Number of passive vents											0 * 10 =	0.0000 (7b)
Number of flueless gas fires											0 * 40 =	0.0000 (7c)
											Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =											40.0000 / (5) =	0.1357 (8)
Pressure test											Yes	
Pressure Test Method											Blower Door	
Measured/design AP50											5.0000 (17)	
Infiltration rate											0.3857 (18)	
Number of sides sheltered											1 (19)	
Shelter factor											(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor											(21) = (18) x (20) =	0.3567 (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	0.4548	0.4459	0.4370	0.3924	0.3835	0.3389	0.3389	0.3300	0.3567	0.3835	0.4013	0.4192 (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	0.6034	0.5994	0.5955	0.5770	0.5735	0.5574	0.5574	0.5544	0.5636	0.5735	0.5805	0.5878 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door			5.8900	1.4000	8.2460			(26)
Windows			31.4600	1.1450	36.0229			(27)
Roof windows			0.8900	1.1450	1.0191			(27a)
New			56.7500	0.1100	6.2425	75.0000	4256.2500	(28a)
New	210.2000	37.3500	172.8500	0.1700	29.3845	190.0000	32841.5000	(29a)
Loft	52.9000		52.9000	0.1100	5.8190	9.0000	476.1000	(30)
Slope	4.2300	0.8900	3.3400	0.1400	0.4676	9.0000	30.0600	(30)
Total net area of external elements Aum(A, m2)			324.0800					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	87.2016			(33)
Main dwelling								
Internal Wall 1			70.4600			75.0000	5284.5000	(32c)
Internal Wall 2			129.5000			9.0000	1165.5000	(32c)
Internal Floor 2			55.8700			18.0000	1005.6600	(32d)
Internal Ceiling 1			56.7500			9.0000	510.7500	(32e)
Heat capacity Cm = Sum(A x k)								(28)...(30) + (32) + (32a)...(32e) = 45570.3200 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								404.6379 (35)
List of Thermal Bridges								
K1 Element				Length	Psi-value	Total		
E2 Other lintels (including other steel lintels)				19.1000	0.2340	4.4694		
E3 Sill				15.2500	0.0230	0.3508		
E4 Jamb				45.6500	0.0180	0.8217		
E5 Ground floor (normal)				31.1100	0.0680	2.1155		
E6 Intermediate floor within a dwelling				30.6800	0.0010	0.0307		
E10 Eaves (insulation at ceiling level)				6.0500	0.0550	0.3327		
E11 Eaves (insulation at rafter level)				6.0500	0.0180	0.1089		
E12 Gable (insulation at ceiling level)				17.3600	0.0370	0.6423		
E13 Gable (insulation at rafter level)				1.4000	0.0390	0.0546		
E16 Corner (normal)				28.0000	0.0400	1.1200		
E17 Corner (inverted - internal area greater than external area)				7.2000	-0.0820	-0.5904		
R1 Head of roof window				0.7500	0.2400	0.1800		
R2 Sill of roof window				0.7500	0.2400	0.1800		
R3 Jamb of roof window				2.3600	0.2400	0.5664		
R11 Upstands or kerbs of rooflights				3.8600	0.2400	0.9264		
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							11.3090 (36)	
Point Thermal bridges							(36a) = 0.0000	
Total fabric heat loss							(33) + (36) + (36a) = 98.5106 (37)	

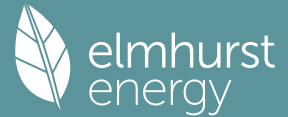
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	58.7186	58.3278	57.9447	56.1453	55.8087	54.2415	54.2415	53.9512	54.8451	55.8087	56.4897	57.2017 (38)
Average = Sum(39)m / 12 =	157.2292	156.8384	156.4553	154.6559	154.3192	152.7520	152.7520	152.4618	153.3557	154.3192	155.0003	155.7123 (39)
												154.6543
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.3961	1.3926	1.3892	1.3733	1.3703	1.3563	1.3563	1.3538	1.3617	1.3703	1.3763	1.3826 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.8297 (42)											
Hot water usage for mixer showers	0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (42a)											
Hot water usage for baths	30.9411	30.4816	29.8345	28.6414	27.7480	26.7573	26.2222	26.8648	27.5644	28.6245	29.8422	30.8365 (42b)
Hot water usage for other uses	43.6087	42.0229	40.4371	38.8514	37.2656	35.6798	35.6798	37.2656	38.8514	40.4371	42.0229	43.6087 (42c)
Average daily hot water use (litres/day)	68.3315 (43)											
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	74.5498	72.5045	70.2716	67.4927	65.0136	62.4371	61.9020	64.1304	66.4158	69.0616	71.8651	74.4452 (44)

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Energy content (annual)	118.0686	103.2454	108.0049	92.3942	87.5207	76.7737	74.8652	79.4068	81.8973	93.7159	102.3850	116.5632 (45)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1134.8410
Water storage loss (or HIU loss):	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (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 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	100.3583	87.7586	91.8041	78.5350	74.3926	65.2577	63.6354	67.4958	69.6127	79.6585	87.0272	99.0787 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	100.3583	87.7586	91.8041	78.5350	74.3926	65.2577	63.6354	67.4958	69.6127	79.6585	87.0272	99.0787 (64)
12Total per year (kWh/year)												964.6148 (64)
Electric shower(s)	57.3910	51.1359	55.8384	53.2859	54.2858	51.7834	53.5095	54.2858	53.2859	55.8384	54.7884	57.3910 (64a)
Heat gains from water heating, kWh/month	39.4373	34.7236	36.9106	32.9552	32.1696	29.2603	29.2862	30.4454	30.7247	33.8742	35.4539	39.1174 (65)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 652.8192 (64a)												

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	141.4836	141.4836	141.4836	141.4836	141.4836	141.4836	141.4836	141.4836	141.4836	141.4836	141.4836	141.4836 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	138.8410	153.7168	138.8410	143.4690	138.8410	143.4690	138.8410	138.8410	143.4690	138.8410	143.4690	138.8410 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	275.2678	278.1242	270.9261	255.6022	236.2586	218.0783	205.9328	203.0764	210.2745	225.5983	244.9419	263.1222 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.1484	37.1484	37.1484	37.1484	37.1484	37.1484	37.1484	37.1484	37.1484	37.1484	37.1484	37.1484 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-113.1868	-113.1868	-113.1868	-113.1868	-113.1868	-113.1868	-113.1868	-113.1868	-113.1868	-113.1868	-113.1868	-113.1868 (71)
Water heating gains (Table 5)	53.0072	51.6721	49.6111	45.7712	43.2387	40.6393	39.3632	40.9212	42.6731	45.5299	49.2415	52.5772 (72)
Total internal gains	532.5610	548.9581	524.8232	510.2875	483.7834	467.6317	449.5820	448.2836	461.8617	475.4142	503.0976	519.9855 (73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W
North					14.6300	10.6334		0.6300	0.7000	0.7700		47.5432 (74)
East					9.1200	19.6403		0.6300	0.7000	0.7700		54.7412 (76)
South					0.8200	46.7521		0.6300	0.7000	0.7700		11.7162 (78)
West					6.8900	19.6403		0.6300	0.7000	0.7700		41.3560 (80)
West					0.8900	25.9973		0.6300	0.7000	1.0000		9.1833 (82)
Solar gains	164.5398	316.4170	519.7692	774.5798	975.9169	1013.6108	958.8190	803.6868	608.2419	374.0069	203.8854	136.2883 (83)
Total gains	697.1008	865.3751	1044.5924	1284.8673	1459.7003	1481.2425	1408.4011	1251.9704	1070.1035	849.4211	706.9830	656.2737 (84)

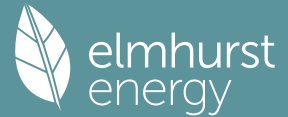
7. Mean internal temperature (heating season)

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	80.5094	80.7100	80.9076	81.8489	82.0275	82.8691	82.8691	83.0268	82.5429	82.0275	81.6671	81.2937
alpha	6.3673	6.3807	6.3938	6.4566	6.4685	6.5246	6.5246	6.5351	6.5029	6.4685	6.4445	6.4196
util living area	0.9998	0.9993	0.9962	0.9706	0.8587	0.6444	0.4752	0.5545	0.8618	0.9923	0.9995	0.9999 (86)
MIT	19.8031	19.9692	20.2373	20.6115	20.8868	20.9856	20.9982	20.9956	20.9153	20.5256	20.0994	19.7819 (87)
Th 2	19.7663	19.7690	19.7716	19.7839	19.7862	19.7970	19.7970	19.7990	19.7928	19.7862	19.7815	19.7767 (88)
util rest of house	0.9997	0.9989	0.9938	0.9522	0.7897	0.5316	0.3465	0.4132	0.7647	0.9851	0.9991	0.9998 (89)
MIT 2	18.6897	18.8578	19.1267	19.4978	19.7270	19.7930	19.7968	19.7984	19.7587	19.4246	18.9982	18.6769 (90)
Living area fraction	18.8363	19.0042	19.2730	19.6445	19.8797	19.9500	19.9550	19.9560	19.9110	19.5696	19.1432	18.8224 (91)
MIT	18.8363	19.0042	19.2730	19.6445	19.8797	19.9500	19.9550	19.9560	19.9110	19.5696	19.1432	18.8224 (92)
Temperature adjustment												0.0000
adjusted MIT	18.8363	19.0042	19.2730	19.6445	19.8797	19.9500	19.9550	19.9560	19.9110	19.5696	19.1432	18.8224 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	696.8486	864.0527	1036.6499	1219.9567	1161.5677	809.5792	512.0334	540.8582	830.4347	835.1064	706.1405	656.1148 (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	2285.5365	2212.0773	1998.4009	1661.6946	1262.2828	817.2296	512.4788	542.1558	891.1568	1384.1831	1866.7027	2276.8910 (97)
Space heating kWh	1181.9838	905.8726	715.5427	318.0513	74.9320	0.0000	0.0000	0.0000	0.0000	408.5131	835.6048	1205.8575 (98a)
Space heating requirement - total per year (kWh/year)												5646.3579
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)												0.0000
Space heating kWh	1181.9838	905.8726	715.5427	318.0513	74.9320	0.0000	0.0000	0.0000	0.0000	408.5131	835.6048	1205.8575 (98c)

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Space heating requirement after solar contribution - total per year (kWh/year)
Space heating per m2

5646.3579
(98c) / (4) = 50.1364 (99)

8c. Space cooling requirement

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000
Heat loss rate W												
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	1435.8690	1130.3650	1158.7097	0.0000	0.0000	0.0000	0.0000 (100)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.9218	0.9654	0.9348	0.0000	0.0000	0.0000	0.0000 (101)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1323.6464	1091.2554	1083.1298	0.0000	0.0000	0.0000	0.0000 (102)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	1663.9789	1582.0605	1403.5400	0.0000	0.0000	0.0000	0.0000 (103)
Cooled fraction	0.0000	0.0000	0.0000	0.0000	0.0000	245.0394	365.1590	238.3852	0.0000	0.0000	0.0000	0.0000 (104)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (105)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	61.2599	91.2898	59.5963	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												212.1459 (107)
Energy for space heating												50.1364 (99)
Energy for space cooling												1.8837 (108)
Total												52.0201 (109)
Fabric Energy Efficiency (DFEE)												52.0 (109)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	56.7500 (1b)	x 2.4000 (2b)	= 136.2000 (1b) - (3b)
First floor	55.8700 (1c)	x 2.8400 (2c)	= 158.6708 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	112.6200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	294.8708 (5)

2. Ventilation rate

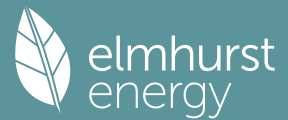
	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) = 0.1357 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3857 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3567 (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	0.4548	0.4459	0.4370	0.3924	0.3835	0.3389	0.3389	0.3300	0.3567	0.3835	0.4013	0.4192 (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	0.6034	0.5994	0.5955	0.5770	0.5735	0.5574	0.5574	0.5544	0.5636	0.5735	0.5805	0.5878 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Main dwelling							
TER Opaque door			5.8900	1.0000	5.8900		(26)
TER Opening Type			21.6600	1.1450	24.8015		(27)
TER Roof Window			0.6100	1.1450	0.8632		(27a)
New			56.7500	0.1300	7.3775		(28a)
New	210.2000	27.5500	182.6500	0.1800	32.8770		(29a)
Loft	52.9000		52.9000	0.1100	5.8190		(30)
Slope	4.2300	0.6100	3.6200	0.1100	0.3982		(30)
Total net area of external elements Aum(A, m2)			324.0800				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		78.0264		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							404.6379 (35)
List of Thermal Bridges							

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K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	19.1000	0.0500	0.9550
E3 Sill	15.2500	0.0500	0.7625
E4 Jamb	45.6500	0.0500	2.2825
E5 Ground floor (normal)	31.1100	0.1600	4.9776
E6 Intermediate floor within a dwelling	30.6800	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	6.0500	0.0600	0.3630
E11 Eaves (insulation at rafter level)	6.0500	0.0400	0.2420
E12 Gable (insulation at ceiling level)	17.3600	0.0600	1.0416
E13 Gable (insulation at rafter level)	1.4000	0.0800	0.1120
E16 Corner (normal)	28.0000	0.0900	2.5200
E17 Corner (inverted - internal area greater than external area)	7.2000	-0.0900	-0.6480
R1 Head of roof window	0.7500	0.0800	0.0600
R2 Sill of roof window	0.7500	0.0600	0.0450
R3 Jamb of roof window	2.3600	0.0800	0.1888
R11 Upstands or kerbs of rooflights	3.8600	0.0800	0.3088
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			13.2108 (36)
Point Thermal bridges		(36a) =	0.0000
Total fabric heat loss		(33) + (36) + (36a) =	91.2372 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	58.7186	58.3278	57.9447	56.1453	55.8087	54.2415	54.2415	53.9512	54.8451	55.8087	56.4897	57.2017 (38)
Heat transfer coeff	149.9559	149.5650	149.1819	147.3826	147.0459	145.4787	145.4787	145.1885	146.0824	147.0459	147.7270	148.4390 (39)
Average = Sum(39)m / 12 =												147.3809
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.3315	1.3281	1.3246	1.3087	1.3057	1.2918	1.2918	1.2892	1.2971	1.3057	1.3117	1.3181 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)												
Assumed occupancy												2.8297 (42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42a)
Hot water usage for baths	30.9411	30.4816	29.8345	28.6414	27.7480	26.7573	26.2222	26.8648	27.5644	28.6245	29.8422	30.8365 (42b)
Hot water usage for other uses	43.6087	42.0229	40.4371	38.8514	37.2656	35.6798	35.6798	37.2656	38.8514	40.4371	42.0229	43.6087 (42c)
Average daily hot water use (litres/day)												68.3315 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	74.5498	72.5045	70.2716	67.4927	65.0136	62.4371	61.9020	64.1304	66.4158	69.0616	71.8651	74.4452 (44)
Energy content (annual)	118.0686	103.2454	108.0049	92.3942	87.5207	76.7737	74.8652	79.4068	81.8973	93.7159	102.3850	116.5632 (45)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss (or HIU loss):	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (62)
Total heat required for water heating calculated for each month	100.3583	87.7586	91.8041	78.5350	74.3926	65.2577	63.6354	67.4958	69.6127	79.6585	87.0272	99.0787 (64)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	100.3583	87.7586	91.8041	78.5350	74.3926	65.2577	63.6354	67.4958	69.6127	79.6585	87.0272	99.0787 (64)
12Total per year (kWh/year)												965 (64)
Electric shower(s)	57.3910	51.1359	55.8384	53.2859	54.2858	51.7834	53.5095	54.2858	53.2859	55.8384	54.7884	57.3910 (64a)
Heat gains from water heating, kWh/month	39.4373	34.7236	36.9106	32.9552	32.1696	29.2603	29.2862	30.4454	30.7247	33.8742	35.4539	39.1174 (65)

5. Internal gains (see Table 5 and 5a)												
Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	141.4836	141.4836	141.4836	141.4836	141.4836	141.4836	141.4836	141.4836	141.4836	141.4836	141.4836	141.4836 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	139.9043	154.8940	139.9043	144.5678	139.9043	139.9043	144.5678	139.9043	144.5678	139.9043	144.5678	139.9043 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	275.2678	278.1242	270.9261	255.6022	236.2586	218.0783	205.9328	203.0764	210.2745	225.5983	244.9419	263.1222 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.1484	37.1484	37.1484	37.1484	37.1484	37.1484	37.1484	37.1484	37.1484	37.1484	37.1484	37.1484 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-113.1868	-113.1868	-113.1868	-113.1868	-113.1868	-113.1868	-113.1868	-113.1868	-113.1868	-113.1868	-113.1868	-113.1868 (71)
Water heating gains (Table 5)	53.0072	51.6721	49.6111	45.7712	43.2387	40.6393	39.3632	40.9212	42.6731	45.5299	49.2415	52.5772 (72)
Total internal gains	533.6243	550.1354	525.8865	511.3862	484.8467	468.7304	450.6454	449.3470	462.9604	476.4776	504.1963	521.0488 (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							
North	10.0800	10.6334	0.6300	0.7000	0.7700	32.7570 (74)						
East	6.2800	19.6403	0.6300	0.7000	0.7700	37.6946 (76)						
South	0.5600	46.7521	0.6300	0.7000	0.7700	8.0013 (78)						

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West	4.7400	19.6403	0.6300	0.7000	0.7700	28.4510 (80)
West	0.6100	25.9973	0.6300	0.7000	1.0000	6.2942 (82)

Solar gains	113.1981	217.7001	357.6481	533.0382	671.6385	697.5996	659.8822	553.0865	418.5443	257.3331	140.2694	93.7601 (83)
Total gains	646.8224	767.8355	883.5347	1044.4245	1156.4852	1166.3300	1110.5276	1002.4335	881.5047	733.8107	644.4657	614.8089 (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	84.4143	84.6349	84.8522	85.8882	86.0848	87.0122	87.0122	87.1861	86.6526	86.0848	85.6880	85.2769
alpha	6.6276	6.6423	6.6568	6.7259	6.7390	6.8008	6.8008	6.8124	6.7768	6.7390	6.7125	6.6851
util living area	0.9999	0.9997	0.9985	0.9885	0.9314	0.7562	0.5706	0.6517	0.9219	0.9963	0.9997	0.9999 (86)
MIT	19.8384	19.9737	20.1983	20.5291	20.8178	20.9692	20.9959	20.9908	20.8773	20.4993	20.1167	19.8230 (87)
Th 2	19.8162	19.8189	19.8216	19.8340	19.8364	19.8473	19.8473	19.8493	19.8431	19.8364	19.8317	19.8267 (88)
util rest of house	0.9999	0.9995	0.9975	0.9803	0.8851	0.6414	0.4247	0.4974	0.8489	0.9927	0.9995	0.9999 (89)
MIT 2	18.7656	18.9030	19.1293	19.4655	19.7280	19.8377	19.8468	19.8479	19.7861	19.4413	19.0564	18.7588 (90)
Living area fraction									fLA = Living area / (4) =			0.1317 (91)
MIT	18.9069	19.0440	19.2701	19.6056	19.8715	19.9867	19.9981	19.9984	19.9298	19.5807	19.1961	18.8990 (92)
Temperature adjustment												0.0000
adjusted MIT	18.9069	19.0440	19.2701	19.6056	19.8715	19.9867	19.9981	19.9984	19.9298	19.5807	19.1961	18.8990 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9998	0.9992	0.9968	0.9780	0.8868	0.6564	0.4441	0.5182	0.8559	0.9914	0.9993	0.9998 (94)
Useful gains	646.6818	767.2519	880.6804	1021.4612	1025.5913	765.6307	493.2329	519.4767	754.4852	727.5262	644.0271	614.7161 (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	2190.3834	2115.4521	1905.0662	1577.8160	1201.5817	783.6442	494.3512	522.4476	851.6357	1320.5691	1786.9143	2181.8984 (97)
Space heating kWh	1148.5140	905.9905	762.1430	400.5754	130.9368	0.0000	0.0000	0.0000	0.0000	441.2240	822.8788	1165.9836 (98a)
Space heating requirement - total per year (kWh/year)												5778.2461
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)												0.0000
Space heating kWh	1148.5140	905.9905	762.1430	400.5754	130.9368	0.0000	0.0000	0.0000	0.0000	441.2240	822.8788	1165.9836 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												5778.2461
Space heating per m2										(98c) / (4) =		51.3075 (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	1367.4997	1076.5423	1103.4324	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8480	0.9235	0.8759	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1159.5872	994.1972	966.4706	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1297.9925	1235.8659	1113.3781	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	99.6518	179.8015	109.2992	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction									fC = cooled area / (4) =			1.0000 (105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	24.9130	44.9504	27.3248	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												97.1881 (107)
Energy for space heating												51.3075 (99)
Energy for space cooling												0.8630 (108)
Total												52.1704 (109)
Fabric Energy Efficiency (TFEE)												52.2 (109)

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

1. Overall dwelling characteristics

Main dwelling	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	56.7500 (1b)	x 2.4000 (2b)	= 136.2000 (1b) - (3b)
First floor	55.8700 (1c)	x 2.8400 (2c)	= 158.6708 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	112.6200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	294.8708 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)

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

0 * 20 = 0.0000 (6b)
0 * 10 = 0.0000 (6c)
0 * 20 = 0.0000 (6d)
0 * 35 = 0.0000 (6e)
0 * 20 = 0.0000 (6f)
5 * 10 = 50.0000 (7a)
0 * 10 = 0.0000 (7b)
0 * 40 = 0.0000 (7c)

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) = 50.0000
Pressure test
Pressure Test Method
Measured/design AP50
Infiltration rate
Number of sides sheltered
Shelter factor
Infiltration rate adjusted to include shelter factor

Air changes per hour
Yes
Blower Door
5.0000 (17)
0.4196 (18)
1 (19)
(20) = 1 - [0.075 x (19)] = 0.9250 (20)
(21) = (18) x (20) = 0.3881 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													
Effective ac	0.4948	0.4851	0.4754	0.4269	0.4172	0.3687	0.3687	0.3590	0.3881	0.4172	0.4366	0.4560	(22b)
	0.6224	0.6177	0.6130	0.5911	0.5870	0.5680	0.5680	0.5644	0.5753	0.5870	0.5953	0.6040	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door			5.8900	1.4000	8.2460			(26)
Windows			31.4600	1.1450	36.0229			(27)
Roof windows			0.8900	1.1450	1.0191			(27a)
New			56.7500	0.1100	6.2425	75.0000	4256.2500	(28a)
New	210.2000	37.3500	172.8500	0.1700	29.3845	190.0000	32841.5000	(29a)
Loft	52.9000		52.9000	0.1100	5.8190	9.0000	476.1000	(30)
Slope	4.2300	0.8900	3.3400	0.1400	0.4676	9.0000	30.0600	(30)
Total net area of external elements Aum(A, m2)			324.0800					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	87.2016		(33)
Main dwelling								
Internal Wall 1			70.4600			75.0000	5284.5000	(32c)
Internal Wall 2			129.5000			9.0000	1165.5000	(32c)
Internal Floor 2			55.8700			18.0000	1005.6600	(32d)
Internal Ceiling 1			56.7500			9.0000	510.7500	(32e)

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K
List of Thermal Bridges

(28)...(30) + (32) + (32a)...(32e) = 45570.3200 (34)
404.6379 (35)

	Length	Psi-value	Total	
K1 Element	19.1000	0.2340	4.4694	
E2 Other lintels (including other steel lintels)	15.2500	0.0230	0.3508	
E3 Sill	45.6500	0.0180	0.8217	
E4 Jamb	31.1100	0.0680	2.1155	
E5 Ground floor (normal)	30.6800	0.0010	0.0307	
E6 Intermediate floor within a dwelling	6.0500	0.0550	0.3327	
E10 Eaves (insulation at ceiling level)	6.0500	0.0180	0.1089	
E11 Eaves (insulation at rafter level)	17.3600	0.0370	0.6423	
E12 Gable (insulation at ceiling level)	1.4000	0.0390	0.0546	
E13 Gable (insulation at rafter level)	28.0000	0.0400	1.1200	
E16 Corner (normal)	7.2000	-0.0820	-0.5904	
E17 Corner (inverted - internal area greater than external area)	0.7500	0.2400	0.1800	
R1 Head of roof window	0.7500	0.2400	0.1800	
R2 Sill of roof window	2.3600	0.2400	0.5664	
R3 Jamb of roof window	3.8600	0.2400	0.9264	
R11 Upstands or kerbs of rooflights				11.3090 (36)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				0.0000 (36a)
Point Thermal Bridges				(33) + (36) + (36a) = 98.5106 (37)
Total fabric heat loss				

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	60.5666	60.1040	59.6506	57.5208	57.1224	55.2674	55.2674	54.9239	55.9819	57.1224	57.9285	58.7712	(38)
Heat transfer coeff	159.0772	158.6146	158.1612	156.0314	155.6329	153.7780	153.7780	153.4345	154.4925	155.6329	156.4390	157.2818	(39)
Average = Sum(39)m / 12 =												156.0295	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.4125	1.4084	1.4044	1.3855	1.3819	1.3655	1.3655	1.3624	1.3718	1.3819	1.3891	1.3966	(40)
HLP (average)												1.3855	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.8297 (42)

Hot water usage for mixer showers 71.6641 70.5871 69.0178 66.0151 63.7992 61.3280 59.9234 61.4809 63.1882 65.8415 68.9086 71.3895 (42a)

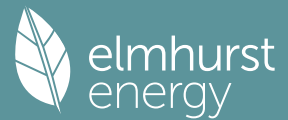
Hot water usage for baths 30.9411 30.4816 29.8345 28.6414 27.7480 26.7573 26.2222 26.8648 27.5644 28.6245 29.8422 30.8365 (42b)

Hot water usage for other uses 43.6087 42.0229 40.4371 38.8514 37.2656 35.6798 35.6798 37.2656 38.8514 40.4371 42.0229 43.6087 (42c)

Average daily hot water use (litres/day) 134.4034 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	146.2139	143.0916	139.2894	133.5078	128.8127	123.7652	121.8254	125.6113	129.6040	134.9030	140.7737	145.8347	(44)
Energy conte	231.5671	203.7606	214.0826	182.7655	173.4067	152.1837	147.3373	155.5330	159.8147	183.0622	200.5579	228.3419	(45)
Energy content (annual)										Total = Sum(45)m =		2232.4131	
Distribution loss (46)m = 0.15 x (45)m													
34.7351 30.5641 32.1124 27.4148 26.0110 22.8276 22.1006 23.3299 23.9722 27.4593 30.0837 34.2513													(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.8600	(48)
Temperature factor from Table 2b												0.5400	(49)

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Enter (49) or (54) in (55)												1.0044 (55)
Total storage loss	31.1364	28.1232	31.1364	30.1320	31.1364	30.1320	31.1364	31.1364	30.1320	31.1364	30.1320	31.1364 (56)
If cylinder contains dedicated solar storage	31.1364	28.1232	31.1364	30.1320	31.1364	30.1320	31.1364	31.1364	30.1320	31.1364	30.1320	31.1364 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	285.9659	252.8950	268.4814	235.4095	227.8055	204.8277	201.7361	209.9318	212.4587	237.4610	253.2019	282.7407 (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	285.9659	252.8950	268.4814	235.4095	227.8055	204.8277	201.7361	209.9318	212.4587	237.4610	253.2019	282.7407 (64)
	Total per year (kWh/year) = Sum(64)m =											2872.9151 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
	Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =											0.0000 (64a)
Heat gains from water heating, kWh/month	120.5151	107.0579	114.7015	102.8847	101.1768	92.7163	92.5087	95.2338	95.2536	104.3872	108.8007	119.4427 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	169.7803	169.7803	169.7803	169.7803	169.7803	169.7803	169.7803	169.7803	169.7803	169.7803	169.7803	169.7803 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	32.4132	28.7891	23.4129	17.7251	13.2497	11.1859	12.0868	15.7109	21.0871	26.7749	31.2503	33.3141 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	410.8474	415.1107	404.3673	381.4959	352.6248	325.4901	307.3624	303.0991	313.8425	336.7139	365.5850	392.7197 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	54.8077	54.8077	54.8077	54.8077	54.8077	54.8077	54.8077	54.8077	54.8077	54.8077	54.8077	54.8077 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-113.1868	-113.1868	-113.1868	-113.1868	-113.1868	-113.1868	-113.1868	-113.1868	-113.1868	-113.1868	-113.1868	-113.1868 (71)
Water heating gains (Table 5)	161.9826	159.3124	154.1687	142.8955	135.9903	128.7726	124.3396	128.0024	132.2966	140.3054	151.1121	160.5413 (72)
Total internal gains	716.6444	714.6133	693.3500	653.5175	613.2659	576.8497	555.1900	558.2134	578.6273	615.1954	659.3485	697.9762 (73)

6. Solar gains

[Jan]						Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North						14.6300	10.6334	0.6300	0.7000	0.7700	47.5432 (74)	
East						9.1200	19.6403	0.6300	0.7000	0.7700	54.7412 (76)	
South						0.8200	46.7521	0.6300	0.7000	0.7700	11.7162 (78)	
West						6.8900	19.6403	0.6300	0.7000	0.7700	41.3560 (80)	
West						0.8900	25.9973	0.6300	0.7000	1.0000	9.1833 (82)	
Solar gains	164.5398	316.4170	519.7692	774.5798	975.9169	1013.6108	958.8190	803.6868	608.2419	374.0069	203.8854	136.2883 (83)
Total gains	881.1842	1031.0303	1213.1192	1428.0973	1589.1828	1590.4605	1514.0090	1361.9002	1186.8692	989.2022	863.2340	834.2645 (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	79.5741	79.8062	80.0350	81.1274	81.3351	82.3162	82.3162	82.5005	81.9355	81.3351	80.9160	80.4824
alpha	6.3049	6.3204	6.3357	6.4085	6.4223	6.4877	6.4877	6.5000	6.4624	6.4223	6.3944	6.3655
util living area	0.9994	0.9981	0.9916	0.9534	0.8216	0.6080	0.4456	0.5147	0.8153	0.9831	0.9984	0.9996 (86)
Living	20.1258	20.2423	20.4440	20.7062	20.8856	20.9441	20.9512	20.9500	20.9060	20.6504	20.3399	20.1095
Non living	18.7499	18.9015	19.1599	19.4895	19.6728	19.7257	19.7283	19.7306	19.7015	19.4341	19.0390	18.7391
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	20.5528	20.2423	20.4440	20.7062	20.8856	20.9441	20.9512	20.9500	20.9060	20.6504	20.3399	20.2341 (87)
Th 2	19.7538	19.7569	19.7600	19.7745	19.7772	19.7899	19.7899	19.7923	19.7850	19.7772	19.7717	19.7660 (88)
util rest of house	0.9990	0.9970	0.9866	0.9273	0.7465	0.4989	0.3239	0.3817	0.7093	0.9689	0.9972	0.9993 (89)
MIT 2	19.3536	18.9015	19.1599	19.4895	19.6728	19.7257	19.7283	19.7306	19.7015	19.4341	19.0390	18.9242 (90)
Living area fraction	fLA = Living area / (4) =											0.1317 (91)
MIT	19.5115	19.0780	19.3290	19.6497	19.8325	19.8862	19.8894	19.8911	19.8601	19.5942	19.2103	19.0967 (92)
Temperature adjustment												0.0000
adjusted MIT	19.5115	19.0780	19.3290	19.6497	19.8325	19.8862	19.8894	19.8911	19.8601	19.5942	19.2103	19.0967 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	880.2234	1026.9781	1193.9305	1319.3849	1192.4352	807.7555	505.5559	534.9054	850.6913	955.4269	860.1405	833.5135 (94)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	2419.7985	2248.8457	2029.0458	1677.2942	1265.6918	812.8960	505.8304	535.6606	889.8907	1399.8004	1894.5259	2342.9729 (97)
Space heating kWh	1145.4439	821.0950	621.3257	257.6947	54.5029	0.0000	0.0000	0.0000	0.0000	330.6139	744.7574	1123.0378 (98a)
Space heating requirement - total per year (kWh/year)												5098.4713
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)												0.0000
Space heating kWh	1145.4439	821.0950	621.3257	257.6947	54.5029	0.0000	0.0000	0.0000	0.0000	330.6139	744.7574	1123.0378 (98c)

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Space heating requirement after solar contribution - total per year (kWh/year)
Space heating per m2

5098.4713
(98c) / (4) = 45.2715 (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 %)												298.5589 (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	1145.4439	821.0950	621.3257	257.6947	54.5029	0.0000	0.0000	0.0000	0.0000	330.6139	744.7574	1123.0378 (98)
Space heating efficiency (main heating system 1)	298.5589	298.5589	298.5589	298.5589	298.5589	0.0000	0.0000	0.0000	0.0000	298.5589	298.5589	298.5589 (210)
Space heating fuel (main heating system)	383.6576	275.0195	208.1083	86.3129	18.2553	0.0000	0.0000	0.0000	0.0000	110.7366	249.4508	376.1529 (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	285.9659	252.8950	268.4814	235.4095	227.8055	204.8277	201.7361	209.9318	212.4587	237.4610	253.2019	282.7407 (64)
Efficiency of water heater (217)m	295.0479	295.0479	295.0479	295.0479	295.0479	295.0479	295.0479	295.0479	295.0479	295.0479	295.0479	295.0479 (216)
Fuel for water heating, kWh/month	96.9218	85.7132	90.9959	79.7869	77.2097	69.4218	68.3740	71.1518	72.0082	80.4822	85.8172	95.8287 (219)
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	28.3711	22.7603	20.4932	15.0142	11.5974	9.4752	10.5795	13.7516	17.8620	23.4360	26.4709	29.1596 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity) (233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												1707.6939 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												295.0479
Water heating fuel used												973.7114 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
Total electricity for the above, kWh/year												0.0000 (231)
Electricity for lighting (calculated in Appendix L)												228.9709 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												0.0000 (233)
Wind generation												0.0000 (234)
Hydro-electric generation (Appendix N)												0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)												0.0000 (235)
Appendix Q - special features												
Energy saved or generated												-0.0000 (236)
Energy used												0.0000 (237)
Total delivered energy for all uses												2910.3761 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1707.6939	16.4900	281.5987 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	973.7114	16.4900	160.5650 (247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000 (247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (249)
Energy for lighting	228.9709	16.4900	37.7573 (250)
Additional standing charges			0.0000 (251)
Total energy cost			479.9210 (255)

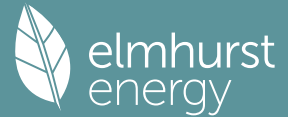
11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.0961 (257)
SAP value		82.2318
SAP rating (Section 12)		82 (258)
SAP band		B

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

Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
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Space heating - main system 1	1707.6939	0.1565	267.1725 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	973.7114	0.1409	137.2341 (264)
Space and water heating			404.4066 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	228.9709	0.1443	33.0476 (268)
Total CO2, kg/year			437.4542 (272)
CO2 emissions per m2			3.8800 (273)
EI value			96.2810
EI rating			96 (274)
EI band			A

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	56.7500 (1b)	x 2.4000 (2b)	= 136.2000 (1b) - (3b)
First floor	55.8700 (1c)	x 2.8400 (2c)	= 158.6708 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	112.6200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	294.8708 (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	5 * 10 = 50.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	50.0000 / (5) = 0.1696 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4196 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3881 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.4000	4.1000	4.1000	3.9000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000 (22)
Wind factor	1.1000	1.0250	1.0250	0.9750	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000 (22a)
Adj infilt rate	0.4269	0.3978	0.3978	0.3784	0.3784	0.3299	0.3299	0.3202	0.3299	0.3687	0.3590	0.3881 (22b)
Effective ac	0.5911	0.5791	0.5791	0.5716	0.5716	0.5544	0.5544	0.5513	0.5544	0.5680	0.5644	0.5753 (25)

3. Heat losses and heat loss parameter

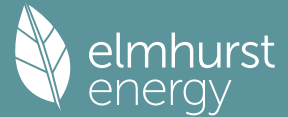
Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Main dwelling							
Door			5.8900	1.4000	8.2460		(26)
Windows			31.4600	1.1450	36.0229		(27)
Roof windows			0.8900	1.1450	1.0191		(27a)
New			56.7500	0.1100	6.2425	75.0000	4256.2500 (28a)
New	210.2000	37.3500	172.8500	0.1700	29.3845	190.0000	32841.5000 (29a)
Loft	52.9000		52.9000	0.1100	5.8190	9.0000	476.1000 (30)
Slope	4.2300	0.8900	3.3400	0.1400	0.4676	9.0000	30.0600 (30)
Total net area of external elements Aum(A, m2)			324.0800				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		87.2016		(33)
Main dwelling							
Internal Wall 1			70.4600			75.0000	5284.5000 (32c)
Internal Wall 2			129.5000			9.0000	1165.5000 (32c)
Internal Floor 2			55.8700			18.0000	1005.6600 (32d)
Internal Ceiling 1			56.7500			9.0000	510.7500 (32e)

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K
(28)...(30) + (32) + (32a)...(32e) = 45570.3200 (34)
404.6379 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	19.1000	0.2340	4.4694
E3 Sill	15.2500	0.0230	0.3508
E4 Jamb	45.6500	0.0180	0.8217
E5 Ground floor (normal)	31.1100	0.0680	2.1155
E6 Intermediate floor within a dwelling	30.6800	0.0010	0.0307
E10 Eaves (insulation at ceiling level)	6.0500	0.0550	0.3327
E11 Eaves (insulation at rafter level)	6.0500	0.0180	0.1089
E12 Gable (insulation at ceiling level)	17.3600	0.0370	0.6423
E13 Gable (insulation at rafter level)	1.4000	0.0390	0.0546
E16 Corner (normal)	28.0000	0.0400	1.1200
E17 Corner (inverted - internal area greater than external area)	7.2000	-0.0820	-0.5904
R1 Head of roof window	0.7500	0.2400	0.1800

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R2 Sill of roof window	0.7500	0.2400	0.1800
R3 Jamb of roof window	2.3600	0.2400	0.5664
R11 Upstands or kerbs of rooflights	3.8600	0.2400	0.9264
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			11.3090 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	98.5106 (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	57.5208	56.3529	56.3529	55.6201	55.6201	53.9483	53.9483	53.6415	53.9483	55.2674	54.9239	55.9819
Heat transfer coeff	156.0314	154.8635	154.8635	154.1306	154.1306	152.4589	152.4589	152.1520	152.4589	153.7780	153.4345	154.4925
Average = Sum(39)m / 12 =												153.7711
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.3855	1.3751	1.3751	1.3686	1.3686	1.3537	1.3537	1.3510	1.3537	1.3655	1.3624	1.3718
HLP (average)												1.3654
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.8297 (42)
Hot water usage for mixer showers												
	71.6641	70.5871	69.0178	66.0151	63.7992	61.3280	59.9234	61.4809	63.1882	65.8415	68.9086	71.3895 (42a)
Hot water usage for baths												
	30.9411	30.4816	29.8345	28.6414	27.7480	26.7573	26.2222	26.8648	27.5644	28.6245	29.8422	30.8365 (42b)
Hot water usage for other uses												
	43.6087	42.0229	40.4371	38.8514	37.2656	35.6798	35.6798	37.2656	38.8514	40.4371	42.0229	43.6087 (42c)
Average daily hot water use (litres/day)												134.4034 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	146.2139	143.0916	139.2894	133.5078	128.8127	123.7652	121.8254	125.6113	129.6040	134.9030	140.7737	145.8347 (44)
Energy conte	231.5671	203.7606	214.0826	182.7655	173.4067	152.1837	147.3373	155.5330	159.8147	183.0622	200.5579	228.3419 (45)
Energy content (annual)										Total = Sum(45)m =		2232.4131
Distribution loss (46)m = 0.15 x (45)m												
	34.7351	30.5641	32.1124	27.4148	26.0110	22.8276	22.1006	23.3299	23.9722	27.4593	30.0837	34.2513 (46)
Water storage loss (or HIU loss):												200.0000 (47)
Store volume												1.8600 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												1.0044 (55)
Enter (49) or (54) in (55)												
Total storage loss												
	31.1364	28.1232	31.1364	30.1320	31.1364	30.1320	31.1364	31.1364	30.1320	31.1364	30.1320	31.1364 (56)
If cylinder contains dedicated solar storage												
	31.1364	28.1232	31.1364	30.1320	31.1364	30.1320	31.1364	31.1364	30.1320	31.1364	30.1320	31.1364 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month												
	285.9659	252.8950	268.4814	235.4095	227.8055	204.8277	201.7361	209.9318	212.4587	237.4610	253.2019	282.7407 (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												
	285.9659	252.8950	268.4814	235.4095	227.8055	204.8277	201.7361	209.9318	212.4587	237.4610	253.2019	282.7407 (64)
Electric shower(s)												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000 (64a)
Heat gains from water heating, kWh/month												
	120.5151	107.0579	114.7015	102.8847	101.1768	92.7163	92.5087	95.2338	95.2536	104.3872	108.8007	119.4427 (65)

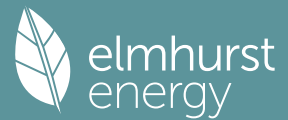
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	169.7803	169.7803	169.7803	169.7803	169.7803	169.7803	169.7803	169.7803	169.7803	169.7803	169.7803	169.7803 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	32.4132	28.7891	23.4129	17.7251	13.2497	11.1859	12.0868	15.7109	21.0871	26.7749	31.2503	33.3141 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	410.8474	415.1107	404.3673	381.4959	352.6248	325.4901	307.3624	303.0991	313.8425	336.7139	365.5850	392.7197 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	54.8077	54.8077	54.8077	54.8077	54.8077	54.8077	54.8077	54.8077	54.8077	54.8077	54.8077	54.8077 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)												
	-113.1868	-113.1868	-113.1868	-113.1868	-113.1868	-113.1868	-113.1868	-113.1868	-113.1868	-113.1868	-113.1868	-113.1868 (71)
Water heating gains (Table 5)												
	161.9826	159.3124	154.1687	142.8955	135.9903	128.7726	124.3396	128.0024	132.2966	140.3054	151.1121	160.5413 (72)
Total internal gains												
	716.6444	714.6133	693.3500	653.5175	613.2659	576.8497	555.1900	558.2134	578.6273	615.1954	659.3485	697.9762 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W
North				14.6300	12.7500		0.6300		0.7000		0.7700		57.0067 (74)
East				9.1200	23.7835		0.6300		0.7000		0.7700		66.2891 (76)
South				0.8200	54.0600		0.6300		0.7000		0.7700		13.5476 (78)
West				6.8900	23.7835		0.6300		0.7000		0.7700		50.0803 (80)
West				0.8900	31.6691		0.6300		0.7000		1.0000		11.1868 (82)
Solar gains	198.1104	333.8860	546.1029	827.1632	1014.8244	1114.2596	1043.9348	892.7377	681.7302	424.1322	242.0449	164.8931	(83)
Total gains	914.7548	1048.4993	1239.4529	1480.6807	1628.0903	1691.1093	1599.1248	1450.9511	1260.3575	1039.3275	901.3934	862.8693	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	81.1274	81.7392	81.7392	82.1279	82.1279	83.0284	83.0284	83.1959	83.0284	82.3162	82.5005	81.9355
alpha	6.4085	6.4493	6.4493	6.4752	6.4752	6.5352	6.5352	6.5464	6.5352	6.4877	6.5000	6.4624
util living area	0.9990	0.9973	0.9868	0.9255	0.7434	0.4846	0.3240	0.3771	0.7177	0.9673	0.9971	0.9993 (86)
Living	20.2067	20.3197	20.5326	20.7786	20.9199	20.9507	20.9524	20.9523	20.9334	20.7321	20.4258	20.1934
Non living	18.8706	19.0215	19.2896	19.5807	19.7088	19.7375	19.7380	19.7402	19.7311	19.5409	19.1654	18.8622
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	20.5942	20.3197	20.5326	20.7786	20.9199	20.9507	20.9524	20.9523	20.9334	20.7321	20.4258	20.3062 (87)
Th 2	19.7745	19.7825	19.7825	19.7875	19.7875	19.7990	19.7990	19.8011	19.7990	19.7899	19.7923	19.7850 (88)
util rest of house	0.9984	0.9957	0.9788	0.8864	0.6534	0.3781	0.2096	0.2518	0.5956	0.9404	0.9950	0.9989 (89)
MIT 2	19.4141	19.0215	19.2896	19.5807	19.7088	19.7375	19.7380	19.7402	19.7311	19.5409	19.1654	19.0285 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	19.5695	19.1924	19.4533	19.7385	19.8683	19.8973	19.8979	19.8998	19.8894	19.6978	19.3314	19.1967 (92)
Temperature adjustment	0.0000											
adjusted MIT	19.5695	19.1924	19.4533	19.7385	19.8683	19.8973	19.8979	19.8998	19.8894	19.6978	19.3314	19.1967 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9983	0.9946	0.9758	0.8845	0.6599	0.3869	0.2191	0.2621	0.6054	0.9376	0.9938	0.9986 (94)
Useful gains	913.2147	1042.8235	1209.5058	1309.6409	1074.3233	654.3426	350.3175	380.3012	763.0650	974.4312	895.8399	861.6580 (95)
Ext temp.	4.9000	5.5000	7.3000	9.7000	12.7000	15.6000	17.6000	17.4000	14.8000	11.4000	7.8000	4.9000 (96)
Heat loss rate W	2288.9068	2120.4542	1882.1040	1547.2375	1104.8509	655.1601	350.3309	380.3450	775.9214	1276.0190	1769.3115	2208.7384 (97)
Space heating kWh	1023.5149	724.1678	500.4131	171.0696	22.7126	0.0000	0.0000	0.0000	0.0000	224.3813	628.8995	1002.2278 (98a)
Space heating requirement - total per year (kWh/year)	4297.3866											
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)	0.0000											
Space heating kWh	1023.5149	724.1678	500.4131	171.0696	22.7126	0.0000	0.0000	0.0000	0.0000	224.3813	628.8995	1002.2278 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	4297.3866											
Space heating per m2	(98c) / (4) = 38.1583 (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 %)	297.7726 (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	1023.5149	724.1678	500.4131	171.0696	22.7126	0.0000	0.0000	0.0000	0.0000	224.3813	628.8995	1002.2278 (98)
Space heating efficiency (main heating system 1)	297.7726	297.7726	297.7726	297.7726	297.7726	0.0000	0.0000	0.0000	0.0000	297.7726	297.7726	297.7726 (210)
Space heating fuel (main heating system)	343.7237	243.1949	168.0521	57.4497	7.6275	0.0000	0.0000	0.0000	0.0000	75.3533	211.2013	336.5749 (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	285.9659	252.8950	268.4814	235.4095	227.8055	204.8277	201.7361	209.9318	212.4587	237.4610	253.2019	282.7407 (64)
Efficiency of water heater (217)m	295.0350	295.0350	295.0350	295.0350	295.0350	295.0350	295.0350	295.0350	295.0350	295.0350	295.0350	295.0350 (216)
Fuel for water heating, kWh/month	96.9261	85.7169	90.9998	79.7904	77.2130	69.4249	68.3770	71.1549	72.0113	80.4857	85.8210	95.8329 (219)
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	28.3711	22.7603	20.4932	15.0142	11.5974	9.4752	10.5795	13.7516	17.8620	23.4360	26.4709	29.1596 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity) (233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1	1443.1772 (211)											
Space heating fuel - main system 2	0.0000 (213)											
Space heating fuel - secondary	0.0000 (215)											
Efficiency of water heater	295.0350											
Water heating fuel used	973.7539 (219)											
Space cooling fuel	0.0000 (221)											
Electricity for pumps and fans:												
Total electricity for the above, kWh/year	0.0000 (231)											
Electricity for lighting (calculated in Appendix L)	228.9709 (232)											

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Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	0.0000 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	2645.9020 (238)

10a. Fuel costs - using BEDF prices (589)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1443.1772	28.4300	410.2953 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	973.7539	28.4300	276.8382 (247)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000 (247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (249)
Energy for lighting	228.9709	28.4300	65.0964 (250)
Additional standing charges			0.0000 (251)
Total energy cost			752.2299 (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	1443.1772	0.1572	226.8734 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	973.7539	0.1409	137.2401 (264)
Space and water heating			364.1135 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	228.9709	0.1443	33.0476 (268)
Total CO2, kg/year			397.1611 (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	1443.1772	1.5820	2283.0495 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	973.7539	1.5211	1481.2200 (278)
Space and water heating			3764.2696 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	228.9709	1.5338	351.2032 (282)
Total Primary energy kWh/year			4115.4727 (286)

SAP 10 EPC IMPROVEMENTS

00001

Current energy efficiency rating: B 82
Current environmental impact rating: A 96

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

Recommended measures:
U Solar photovoltaic panels SAP change + 5.5 Cost change -£ 269 CO2 change -127 kg (32.0%)

Measures omitted - SAP change or cost saving too small:
N Solar water heating + 0.9 -£ 51 -22 kg (5.5%)

	Typical annual savings	Energy efficiency	Environmental impact
Recommended measures			
Solar photovoltaic panels	£269 1.13 kg/m²	B 88	A 97
Total Savings	£269 1.13 kg/m²		

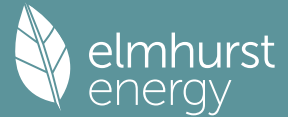
Potential energy efficiency rating: B 88
Potential environmental impact rating: A 97

Fuel prices for cost data on this page from database revision number 589 TEST (12 Dec 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

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

	Current £752	Potential £752	Saving £0
Electricity			
Space heating	£410	£410	£0
Water heating	£277	£277	£0
Lighting	£65	£65	£0
Generated (PV)	-£0	-£269	£269
Total cost of fuels	£752	£483	£269
Total cost of uses	£752	£483	£269
Delivered energy	23 kWh/m²	15 kWh/m²	8 kWh/m²
Carbon dioxide emissions	0.4 tonnes	0.3 tonnes	0.1 tonnes
CO2 emissions per m²	4 kg/m²	2 kg/m²	1 kg/m²
Primary energy	37 kWh/m²	24 kWh/m²	13 kWh/m²

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	56.7500 (1b)	x 2.4000 (2b)	= 136.2000 (1b) - (3b)
First floor	55.8700 (1c)	x 2.8400 (2c)	= 158.6708 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	112.6200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	294.8708 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	5 * 10 = 50.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	50.0000 / (5) = 0.1696 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4196 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3881 (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	0.4948	0.4851	0.4754	0.4269	0.4172	0.3687	0.3687	0.3590	0.3881	0.4172	0.4366	0.4560 (22b)
Effective ac	0.6224	0.6177	0.6130	0.5911	0.5870	0.5680	0.5680	0.5644	0.5753	0.5870	0.5953	0.6040 (25)

3. Heat losses and heat loss parameter

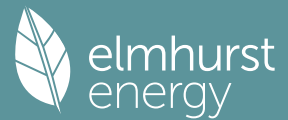
Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Door			5.8900	1.4000	8.2460		(26)
Windows			31.4600	1.1450	36.0229		(27)
Roof windows			0.8900	1.1450	1.0191		(27a)
New			56.7500	0.1100	6.2425	75.0000	4256.2500 (28a)
New	210.2000	37.3500	172.8500	0.1700	29.3845	190.0000	32841.5000 (29a)
Loft	52.9000		52.9000	0.1100	5.8190	9.0000	476.1000 (30)
Slope	4.2300	0.8900	3.3400	0.1400	0.4676	9.0000	30.0600 (30)
Total net area of external elements Aum(A, m ²)			324.0800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	87.2016		(33)
Main dwelling							
Internal Wall 1			70.4600			75.0000	5284.5000 (32c)
Internal Wall 2			129.5000			9.0000	1165.5000 (32c)
Internal Floor 2			55.8700			18.0000	1005.6600 (32d)
Internal Ceiling 1			56.7500			9.0000	510.7500 (32e)

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K
(28)...(30) + (32) + (32a)...(32e) = 45570.3200 (34)
404.6379 (35)

List of Thermal Bridges	Length	Psi-value	Total
K1 Element	19.1000	0.2340	4.4694
E2 Other lintels (including other steel lintels)	15.2500	0.0230	0.3508
E3 Sill	45.6500	0.0180	0.8217
E4 Jamb	31.1100	0.0680	2.1155
E5 Ground floor (normal)	30.6800	0.0010	0.0307
E6 Intermediate floor within a dwelling	6.0500	0.0550	0.3327
E10 Eaves (insulation at ceiling level)	6.0500	0.0180	0.1089
E11 Eaves (insulation at rafter level)	17.3600	0.0370	0.6423
E12 Gable (insulation at ceiling level)	1.4000	0.0390	0.0546
E13 Gable (insulation at rafter level)	28.0000	0.0400	1.1200
E16 Corner (normal)	7.2000	-0.0820	-0.5904
E17 Corner (inverted - internal area greater than external area)	0.7500	0.2400	0.1800
R1 Head of roof window	0.7500	0.2400	0.1800
R2 Sill of roof window	2.3600	0.2400	0.5664
R3 Jamb of roof window	3.8600	0.2400	0.9264
R11 Upstands or kerbs of rooflights			11.3090 (36)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			(36a) = 0.0000
Point Thermal bridges			(33) + (36) + (36a) = 98.5106 (37)
Total fabric heat loss			

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	60.5666	60.1040	59.6506	57.5208	57.1224	55.2674	55.2674	54.9239	55.9819	57.1224	57.9285	58.7712 (38)
Heat transfer coeff	159.0772	158.6146	158.1612	156.0314	155.6329	153.7780	153.7780	153.4345	154.4925	155.6329	156.4390	157.2818 (39)
Average = Sum(39)m / 12 =												156.0295

Full SAP Calculation Printout



HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.4125	1.4084	1.4044	1.3855	1.3819	1.3655	1.3655	1.3624	1.3718	1.3819	1.3891	1.3966 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	1.3855 31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.8297 (42)
Hot water usage for mixer showers	71.6641	70.5871	69.0178	66.0151	63.7992	61.3280	59.9234	61.4809	63.1882	65.8415	68.9086	71.3895 (42a)
Hot water usage for baths	30.9411	30.4816	29.8345	28.6414	27.7480	26.7573	26.2222	26.8648	27.5644	28.6245	29.8422	30.8365 (42b)
Hot water usage for other uses	43.6087	42.0229	40.4371	38.8514	37.2656	35.6798	35.6798	37.2656	38.8514	40.4371	42.0229	43.6087 (42c)
Average daily hot water use (litres/day)												134.4034 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	146.2139	143.0916	139.2894	133.5078	128.8127	123.7652	121.8254	125.6113	129.6040	134.9030	140.7737	145.8347 (44)
Energy content (annual)	231.5671	203.7606	214.0826	182.7655	173.4067	152.1837	147.3373	155.5330	159.8147	183.0622	200.5579	228.3419 (45)
Distribution loss (46)m = 0.15 x (45)m	34.7351	30.5641	32.1124	27.4148	26.0110	22.8276	22.1006	23.3299	23.9722	27.4593	30.0837	34.2513 (46)
Water storage loss (or HIU loss):												200.0000 (47)
Store volume												1.8600 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												1.0044 (55)
Enter (49) or (54) in (55)												
Total storage loss	31.1364	28.1232	31.1364	30.1320	31.1364	30.1320	31.1364	31.1364	30.1320	31.1364	30.1320	31.1364 (56)
If cylinder contains dedicated solar storage	31.1364	28.1232	31.1364	30.1320	31.1364	30.1320	31.1364	31.1364	30.1320	31.1364	30.1320	31.1364 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	285.9659	252.8950	268.4814	235.4095	227.8055	204.8277	201.7361	209.9318	212.4587	237.4610	253.2019	282.7407 (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	285.9659	252.8950	268.4814	235.4095	227.8055	204.8277	201.7361	209.9318	212.4587	237.4610	253.2019	282.7407 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000 (64a)
Heat gains from water heating, kWh/month	120.5151	107.0579	114.7015	102.8847	101.1768	92.7163	92.5087	95.2338	95.2536	104.3872	108.8007	119.4427 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	169.7803	169.7803	169.7803	169.7803	169.7803	169.7803	169.7803	169.7803	169.7803	169.7803	169.7803	169.7803 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	32.4132	28.7891	23.4129	17.7251	13.2497	11.1859	12.0868	15.7109	21.0871	26.7749	31.2503	33.3141 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	410.8474	415.1107	404.3673	381.4959	352.6248	325.4901	307.3624	303.0991	313.8425	336.7139	365.5850	392.7197 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	54.8077	54.8077	54.8077	54.8077	54.8077	54.8077	54.8077	54.8077	54.8077	54.8077	54.8077	54.8077 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-113.1868	-113.1868	-113.1868	-113.1868	-113.1868	-113.1868	-113.1868	-113.1868	-113.1868	-113.1868	-113.1868	-113.1868 (71)
Water heating gains (Table 5)	161.9826	159.3124	154.1687	142.8955	135.9903	128.7726	124.3396	128.0024	132.2966	140.3054	151.1121	160.5413 (72)
Total internal gains	716.6444	714.6133	693.3500	653.5175	613.2659	576.8497	555.1900	558.2134	578.6273	615.1954	659.3485	697.9762 (73)

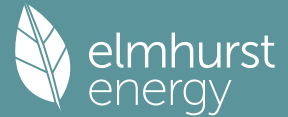
6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North					14.6300	10.6334		0.6300	0.7000	0.7700	47.5432 (74)	
East					9.1200	19.6403		0.6300	0.7000	0.7700	54.7412 (76)	
South					0.8200	46.7521		0.6300	0.7000	0.7700	11.7162 (78)	
West					6.8900	19.6403		0.6300	0.7000	0.7700	41.3560 (80)	
West					0.8900	25.9973		0.6300	0.7000	1.0000	9.1833 (82)	
Solar gains	164.5398	316.4170	519.7692	774.5798	975.9169	1013.6108	958.8190	803.6868	608.2419	374.0069	203.8854	136.2883 (83)
Total gains	881.1842	1031.0303	1213.1192	1428.0973	1589.1828	1590.4605	1514.0090	1361.9002	1186.8692	989.2022	863.2340	834.2645 (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	79.5741	79.8062	80.0350	81.1274	81.3351	82.3162	82.3162	82.5005	81.9355	81.3351	80.9160	80.4824
alpha	6.3049	6.3204	6.3357	6.4085	6.4223	6.4877	6.4877	6.5000	6.4624	6.4223	6.3944	6.3655
util living area	0.9994	0.9981	0.9916	0.9534	0.8216	0.6080	0.4456	0.5147	0.8153	0.9831	0.9984	0.9996 (86)
Living	20.1258	20.2423	20.4440	20.7062	20.8856	20.9441	20.9512	20.9500	20.9060	20.6504	20.3399	20.1095
Non living	18.7499	18.9015	19.1599	19.4895	19.6728	19.7257	19.7283	19.7306	19.7015	19.4341	19.0390	18.7391
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0

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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	20.5528	20.2423	20.4440	20.7062	20.8856	20.9441	20.9512	20.9500	20.9060	20.6504	20.3399	20.2341 (87)
Th 2	19.7538	19.7569	19.7600	19.7745	19.7772	19.7899	19.7899	19.7923	19.7850	19.7772	19.7717	19.7660 (88)
util rest of house	0.9990	0.9970	0.9866	0.9273	0.7465	0.4989	0.3239	0.3817	0.7093	0.9689	0.9972	0.9993 (89)
MIT 2	19.3536	18.9015	19.1599	19.4895	19.6728	19.7257	19.7283	19.7306	19.7015	19.4341	19.0390	18.9242 (90)
Living area fraction									fLA = Living area / (4) =			
MIT	19.5115	19.0780	19.3290	19.6497	19.8325	19.8862	19.8894	19.8911	19.8601	19.5942	19.2103	0.1317 (91)
Temperature adjustment												0.0000
adjusted MIT	19.5115	19.0780	19.3290	19.6497	19.8325	19.8862	19.8894	19.8911	19.8601	19.5942	19.2103	19.0967 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9989	0.9961	0.9842	0.9239	0.7503	0.5079	0.3339	0.3928	0.7168	0.9659	0.9964	0.9991 (94)
Useful gains	880.2234	1026.9781	1193.9305	1319.3849	1192.4352	807.7555	505.5559	534.9054	850.6913	955.4269	860.1405	833.5135 (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	2419.7985	2248.8457	2029.0458	1677.2942	1265.6918	812.8960	505.8304	535.6606	889.8907	1399.8004	1894.5259	2342.9729 (97)
Space heating kWh	1145.4439	821.0950	621.3257	257.6947	54.5029	0.0000	0.0000	0.0000	0.0000	330.6139	744.7574	1123.0378 (98a)
Space heating requirement - total per year (kWh/year)												5098.4713
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)												0.0000
Space heating kWh	1145.4439	821.0950	621.3257	257.6947	54.5029	0.0000	0.0000	0.0000	0.0000	330.6139	744.7574	1123.0378 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												5098.4713
Space heating per m2										(98c) / (4) =		
												45.2715 (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 %)												298.5589 (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	1145.4439	821.0950	621.3257	257.6947	54.5029	0.0000	0.0000	0.0000	0.0000	330.6139	744.7574	1123.0378 (98)
Space heating efficiency (main heating system 1)	298.5589	298.5589	298.5589	298.5589	298.5589	0.0000	0.0000	0.0000	0.0000	298.5589	298.5589	298.5589 (210)
Space heating fuel (main heating system)	383.6576	275.0195	208.1083	86.3129	18.2553	0.0000	0.0000	0.0000	0.0000	110.7366	249.4508	376.1529 (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	285.9659	252.8950	268.4814	235.4095	227.8055	204.8277	201.7361	209.9318	212.4587	237.4610	253.2019	282.7407 (64)
Efficiency of water heater (217)m	295.0479	295.0479	295.0479	295.0479	295.0479	295.0479	295.0479	295.0479	295.0479	295.0479	295.0479	295.0479 (216)
Fuel for water heating, kWh/month	96.9218	85.7132	90.9959	79.7869	77.2097	69.4218	68.3740	71.1518	72.0082	80.4822	85.8172	95.8287 (219)
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	28.3711	22.7603	20.4932	15.0142	11.5974	9.4752	10.5795	13.7516	17.8620	23.4360	26.4709	29.1596 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-39.2345	-58.7716	-88.3544	-100.0501	-106.2886	-98.4526	-97.0672	-90.1044	-77.8893	-66.4554	-43.8274	-33.4382 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity) (233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												1707.6939 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												295.0479
Water heating fuel used												973.7114 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
Total electricity for the above, kWh/year												0.0000 (231)
Electricity for lighting (calculated in Appendix L)												228.9709 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-899.9338 (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												2010.4423 (238)

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10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1707.6939	16.4900	281.5987 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	973.7114	16.4900	160.5650 (247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000 (247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (249)
Energy for lighting	228.9709	16.4900	37.7573 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-899.9338	16.4900	-148.3991
PV Unit electricity exported	0.0000	5.5900	0.0000
Total			-148.3991 (252)
Total energy cost			331.5219 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	0.7572 (257)
SAP value		87.7260
SAP rating (Section 12)		88 (258)
SAP band		B

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1707.6939	0.1565	267.1725 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	973.7114	0.1409	137.2341 (264)
Space and water heating			404.4066 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	228.9709	0.1443	33.0476 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-899.9338	0.1344	-120.9434
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-120.9434 (269)
Total CO2, kg/year			316.5108 (272)
CO2 emissions per m2			2.8100 (273)
EI value			97.3092
EI rating			97 (274)
EI band			A

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

1. Overall dwelling characteristics

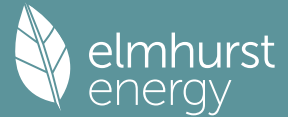
	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	56.7500 (1b)	x 2.4000 (2b)	= 136.2000 (1b) - (3b)
First floor	55.8700 (1c)	x 2.8400 (2c)	= 158.6708 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	112.6200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	294.8708 (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	5 * 10 = 50.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	50.0000 / (5) = 0.1696 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4196 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3881 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.4000	4.1000	4.1000	3.9000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000 (22)
Wind factor	1.1000	1.0250	1.0250	0.9750	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000 (22a)
Adj infilt rate												

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Effective ac	0.4269	0.3978	0.3978	0.3784	0.3784	0.3299	0.3299	0.3202	0.3299	0.3687	0.3590	0.3881 (22b)
	0.5911	0.5791	0.5791	0.5716	0.5716	0.5544	0.5544	0.5513	0.5544	0.5680	0.5644	0.5753 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Main dwelling							
Door			5.8900	1.4000	8.2460		(26)
Windows			31.4600	1.1450	36.0229		(27)
Roof windows			0.8900	1.1450	1.0191		(27a)
New			56.7500	0.1100	6.2425	75.0000	4256.2500 (28a)
New	210.2000	37.3500	172.8500	0.1700	29.3845	190.0000	32841.5000 (29a)
Loft	52.9000		52.9000	0.1100	5.8190	9.0000	476.1000 (30)
Slope	4.2300	0.8900	3.3400	0.1400	0.4676	9.0000	30.0600 (30)
Total net area of external elements Aum(A, m2)			324.0800				(31)
Fabric heat loss, W/K = Sum (A x U)					87.2016		(33)
Main dwelling							
Internal Wall 1			70.4600			75.0000	5284.5000 (32c)
Internal Wall 2			129.5000			9.0000	1165.5000 (32c)
Internal Floor 2			55.8700			18.0000	1005.6600 (32d)
Internal Ceiling 1			56.7500			9.0000	510.7500 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 45570.3200 (34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 404.6379 (35)

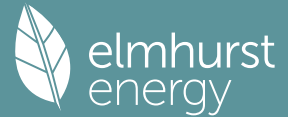
List of Thermal Bridges	Length	Psi-value	Total
K1 Element	19.1000	0.2340	4.4694
E2 Other lintels (including other steel lintels)	15.2500	0.0230	0.3508
E3 Sill	45.6500	0.0180	0.8217
E4 Jamb	31.1100	0.0680	2.1155
E5 Ground floor (normal)	30.6800	0.0010	0.0307
E6 Intermediate floor within a dwelling	6.0500	0.0550	0.3327
E10 Eaves (insulation at ceiling level)	6.0500	0.0180	0.1089
E11 Eaves (insulation at rafter level)	17.3600	0.0370	0.6423
E12 Gable (insulation at ceiling level)	1.4000	0.0390	0.0546
E13 Gable (insulation at rafter level)	28.0000	0.0400	1.1200
E16 Corner (normal)	7.2000	-0.0820	-0.5904
E17 Corner (inverted - internal area greater than external area)	0.7500	0.2400	0.1800
R1 Head of roof window	0.7500	0.2400	0.1800
R2 Sill of roof window	2.3600	0.2400	0.5664
R3 Jamb of roof window	3.8600	0.2400	0.9264
R11 Upstands or kerbs of rooflights			11.3090 (36)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			0.0000 (36a) =
Point Thermal Bridges			
Total fabric heat loss			(33) + (36) + (36a) = 98.5106 (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	57.5208	56.3529	56.3529	55.6201	55.6201	53.9483	53.9483	53.6415	53.9483	55.2674	54.9239	55.9819 (38)
Heat transfer coeff	156.0314	154.8635	154.8635	154.1306	154.1306	152.4589	152.4589	152.1520	152.4589	153.7780	153.4345	154.4925 (39)
Average = Sum(39)m / 12 =												153.7711
HLP	1.3855	1.3751	1.3751	1.3686	1.3686	1.3537	1.3537	1.3510	1.3537	1.3655	1.3624	1.3718 (40)
HLP (average)												1.3654
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.8297 (42)
Hot water usage for mixer showers												
71.6641	70.5871	69.0178	66.0151	63.7992	61.3280	59.9234	61.4809	63.1882	65.8415	68.9086	71.3895 (42a)	
Hot water usage for baths												
30.9411	30.4816	29.8345	28.6414	27.7480	26.7573	26.2222	26.8648	27.5644	28.6245	29.8422	30.8365 (42b)	
Hot water usage for other uses												
43.6087	42.0229	40.4371	38.8514	37.2656	35.6798	35.6798	37.2656	38.8514	40.4371	42.0229	43.6087 (42c)	
Average daily hot water use (litres/day)												134.4034 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
146.2139	143.0916	139.2894	133.5078	128.8127	123.7652	121.8254	125.6113	129.6040	134.9030	140.7737	145.8347 (44)	
231.5671	203.7606	214.0826	182.7655	173.4067	152.1837	147.3373	155.5330	159.8147	183.0622	200.5579	228.3419 (45)	
Energy content (annual)										Total = Sum(45)m =		2232.4131
Distribution loss (46)m = 0.15 x (45)m												
34.7351	30.5641	32.1124	27.4148	26.0110	22.8276	22.1006	23.3299	23.9722	27.4593	30.0837	34.2513 (46)	
Water storage loss (or HIU loss):												
Store volume												200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.8600 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												1.0044 (55)
Total storage loss												
31.1364	28.1232	31.1364	30.1320	31.1364	30.1320	31.1364	31.1364	30.1320	31.1364	30.1320	31.1364 (56)	
If cylinder contains dedicated solar storage												
31.1364	28.1232	31.1364	30.1320	31.1364	30.1320	31.1364	31.1364	30.1320	31.1364	30.1320	31.1364 (57)	
23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)	
Total heat required for water heating calculated for each month												
285.9659	252.8950	268.4814	235.4095	227.8055	204.8277	201.7361	209.9318	212.4587	237.4610	253.2019	282.7407 (62)	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)	
-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)	
Output from w/h												
285.9659	252.8950	268.4814	235.4095	227.8055	204.8277	201.7361	209.9318	212.4587	237.4610	253.2019	282.7407 (64)	
										Total per year (kWh/year) = Sum(64)m =		2872.9151 (64)
Electric shower(s)												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)	
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000 (64a)
Heat gains from water heating, kWh/month												
120.5151	107.0579	114.7015	102.8847	101.1768	92.7163	92.5087	95.2338	95.2536	104.3872	108.8007	119.4427 (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	169.7803	169.7803	169.7803	169.7803	169.7803	169.7803	169.7803	169.7803	169.7803	169.7803	169.7803	169.7803 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	32.4132	28.7891	23.4129	17.7251	13.2497	11.1859	12.0868	15.7109	21.0871	26.7749	31.2503	33.3141 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	410.8474	415.1107	404.3673	381.4959	352.6248	325.4901	307.3624	303.0991	313.8425	336.7139	365.5850	392.7197 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	54.8077	54.8077	54.8077	54.8077	54.8077	54.8077	54.8077	54.8077	54.8077	54.8077	54.8077	54.8077 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-113.1868	-113.1868	-113.1868	-113.1868	-113.1868	-113.1868	-113.1868	-113.1868	-113.1868	-113.1868	-113.1868	-113.1868 (71)
Water heating gains (Table 5)	161.9826	159.3124	154.1687	142.8955	135.9903	128.7726	124.3396	128.0024	132.2966	140.3054	151.1121	160.5413 (72)
Total internal gains	716.6444	714.6133	693.3500	653.5175	613.2659	576.8497	555.1900	558.2134	578.6273	615.1954	659.3485	697.9762 (73)

6. Solar gains

[Jan]	Area m ²		Solar flux Table 6a W/m ²		Specific data or Table 6b		Specific data or Table 6c		Access factor Table 6d		Gains W	
North	14.6300		12.7500		0.6300		0.7000		0.7700		57.0067 (74)	
East	9.1200		23.7835		0.6300		0.7000		0.7700		66.2891 (76)	
South	0.8200		54.0600		0.6300		0.7000		0.7700		13.5476 (78)	
West	6.8900		23.7835		0.6300		0.7000		0.7700		50.0803 (80)	
West	0.8900		31.6691		0.6300		0.7000		1.0000		11.1868 (82)	
Solar gains	198.1104	333.8860	546.1029	827.1632	1014.8244	1114.2596	1043.9348	892.7377	681.7302	424.1322	242.0449	164.8931 (83)
Total gains	914.7548	1048.4993	1239.4529	1480.6807	1628.0903	1691.1093	1599.1248	1450.9511	1260.3575	1039.3275	901.3934	862.8693 (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	81.1274	81.7392	81.7392	82.1279	82.1279	83.0284	83.0284	83.1959	83.0284	82.3162	82.5005	81.9355
alpha	6.4085	6.4493	6.4493	6.4752	6.4752	6.5352	6.5352	6.5464	6.5352	6.4877	6.5000	6.4624
util living area	0.9990	0.9973	0.9868	0.9255	0.7434	0.4846	0.3240	0.3771	0.7177	0.9673	0.9971	0.9993 (86)
Living	20.2067	20.3197	20.5326	20.7786	20.9199	20.9507	20.9524	20.9523	20.9334	20.7321	20.4258	20.1934
Non living	18.8706	19.0215	19.2896	19.5807	19.7088	19.7375	19.7380	19.7402	19.7311	19.5409	19.1654	18.8622
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	20.5942	20.3197	20.5326	20.7786	20.9199	20.9507	20.9524	20.9523	20.9334	20.7321	20.4258	20.3062 (87)
Th 2	19.7745	19.7825	19.7825	19.7875	19.7875	19.7990	19.7990	19.8011	19.7990	19.7899	19.7923	19.7850 (88)
util rest of house	0.9984	0.9957	0.9788	0.8864	0.6534	0.3781	0.2096	0.2518	0.5956	0.9404	0.9950	0.9989 (89)
MIT 2	19.4141	19.0215	19.2896	19.5807	19.7088	19.7375	19.7380	19.7402	19.7311	19.5409	19.1654	19.0285 (90)
Living area fraction	19.5695	19.1924	19.4533	19.7385	19.8683	19.8973	19.8979	19.8998	19.8894	19.6978	19.3314	0.1317 (91)
MIT	19.5695	19.1924	19.4533	19.7385	19.8683	19.8973	19.8979	19.8998	19.8894	19.6978	19.3314	19.1967 (92)
Temperature adjustment												0.0000
adjusted MIT	19.5695	19.1924	19.4533	19.7385	19.8683	19.8973	19.8979	19.8998	19.8894	19.6978	19.3314	19.1967 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9983	0.9946	0.9758	0.8845	0.6599	0.3869	0.2191	0.2621	0.6054	0.9376	0.9938	0.9986 (94)
Useful gains	913.2147	1042.8235	1209.5058	1309.6409	1074.3233	654.3426	350.3175	380.3012	763.0650	974.4312	895.8399	861.6580 (95)
Ext temp.	4.9000	5.5000	7.3000	9.7000	12.7000	15.6000	17.6000	17.4000	14.8000	11.4000	7.8000	4.9000 (96)
Heat loss rate W	2288.9068	2120.4542	1882.1040	1547.2375	1104.8509	655.1601	350.3309	380.3450	775.9214	1276.0190	1769.3115	2208.7384 (97)
Space heating kWh	1023.5149	724.1678	500.4131	171.0696	22.7126	0.0000	0.0000	0.0000	0.0000	224.3813	628.8995	1002.2278 (98a)
Space heating requirement - total per year (kWh/year)												4297.3866
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)												0.0000
Space heating kWh	1023.5149	724.1678	500.4131	171.0696	22.7126	0.0000	0.0000	0.0000	0.0000	224.3813	628.8995	1002.2278 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4297.3866
Space heating per m ²										(98c) / (4) =		38.1583 (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 %)												297.7726 (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	1023.5149	724.1678	500.4131	171.0696	22.7126	0.0000	0.0000	0.0000	0.0000	224.3813	628.8995	1002.2278 (98)
Space heating efficiency (main heating system 1)	297.7726	297.7726	297.7726	297.7726	297.7726	0.0000	0.0000	0.0000	0.0000	297.7726	297.7726	297.7726 (210)
Space heating fuel (main heating system)	343.7237	243.1949	168.0521	57.4497	7.6275	0.0000	0.0000	0.0000	0.0000	75.3533	211.2013	336.5749 (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)

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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	285.9659	252.8950	268.4814	235.4095	227.8055	204.8277	201.7361	209.9318	212.4587	237.4610	253.2019	282.7407	(64)
Efficiency of water heater	295.0350	295.0350	295.0350	295.0350	295.0350	295.0350	295.0350	295.0350	295.0350	295.0350	295.0350	295.0350	(216)
(217)m	295.0350	295.0350	295.0350	295.0350	295.0350	295.0350	295.0350	295.0350	295.0350	295.0350	295.0350	295.0350	(217)
Fuel for water heating, kWh/month	96.9261	85.7169	90.9998	79.7904	77.2130	69.4249	68.3770	71.1549	72.0113	80.4857	85.8210	95.8329	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(231)
Lighting	28.3711	22.7603	20.4932	15.0142	11.5974	9.4752	10.5795	13.7516	17.8620	23.4360	26.4709	29.1596	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-45.4022	-60.2824	-89.3234	-101.4139	-106.8202	-103.1774	-101.1613	-95.1216	-83.0262	-70.9204	-49.6350	-38.9612	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1443.1772	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												295.0350	
Water heating fuel used												973.7539	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000	(231)
Electricity for lighting (calculated in Appendix L)												228.9709	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-945.2452	(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												1700.6568	(238)

10a. Fuel costs - using BEDF prices (589)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1443.1772	28.4300	410.2953	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	973.7539	28.4300	276.8382	(247)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(249)
Energy for lighting	228.9709	28.4300	65.0964	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-945.2452	28.4300	-268.7332	
PV Unit electricity exported	0.0000	5.8100	0.0000	
Total			-268.7332	(252)
Total energy cost			483.4967	(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	1443.1772	0.1572	226.8734	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	973.7539	0.1409	137.2401	(264)
Space and water heating			364.1135	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	228.9709	0.1443	33.0476	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-945.2452	0.1346	-127.1984	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-127.1984	(269)
Total CO2, kg/year			269.9627	(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	1443.1772	1.5820	2283.0495	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	973.7539	1.5211	1481.2200	(278)
Space and water heating			3764.2696	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	228.9709	1.5338	351.2032	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-945.2452	1.4973	-1415.3454	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-1415.3454	(283)

Total Primary energy kWh/year

2700.1273 (286)

Predicted Energy Assessment

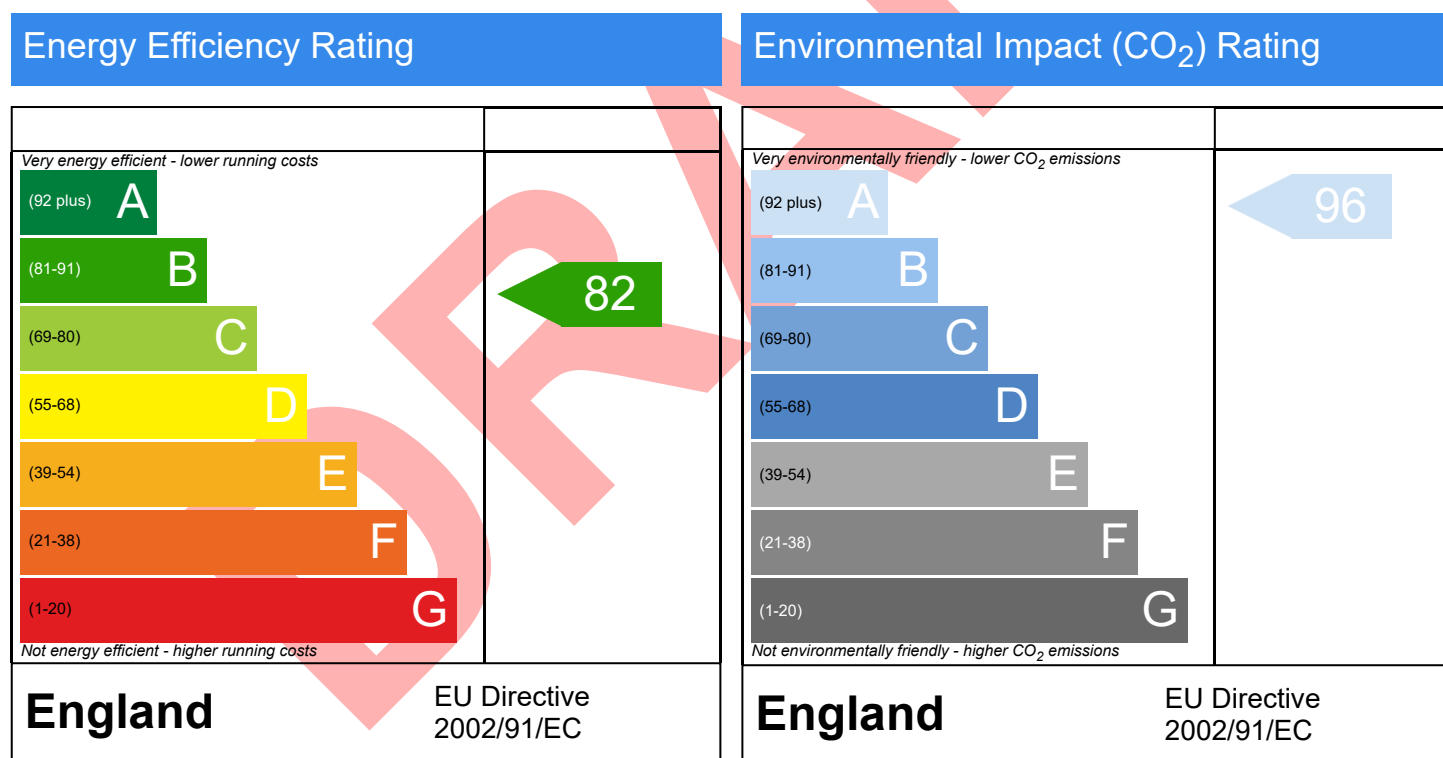


Unit 3, 9 , Circuit Lane , Reading , RG30 5HB

Dwelling type: House, Detached
Date of assessment: 08/01/2026
SAP Version: 10.2
Produced by: Matthew Carter
Total floor area: 112.62 m²
DRRN:

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

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



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

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

Summary for Input Data

Plot Reference	01775	Issued on Date	08/01/2026
Assessment Reference	00001	Plot Type Ref	
Plot Address	Unit 3, 9, Circuit Lane, Reading, RG30 5HB	SAP Version	10.2

SAP Rating	82 B	DER	4.00	TER	13.23
Environmental	96 A	% DER < TER			69.77
CO ₂ Emissions (t/year)	0.4	DFEE	52.02	TFEE	52.17
Compliance Check	See BREL	% DFEE < TFEE			0.29
% DPER < TPER	40.39	DPER	41.44	TPER	69.51

Assessor Details	Mr. Matthew Carter	Assessor ID	7869-0001
Client	Simon Knight, Simon Knight		

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

Orientation	West	
Property Tenture	ND	
Transaction Type	6	
Terrain Type	Suburban	
1.0 Property Type	House, Detached	
2.0 Number of Storeys	2	
3.0 Date Built	2026	
4.0 Sheltered Sides	1	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	404.64	kJ/m²K
7.0 Electricity Tariff		
Smart electricity meter fitted	No	
Smart gas meter fitted	No	

7.0 Measurements				
	Ground floor:	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
	1st Storey:	31.11 m	56.75 m ²	2.40 m
		30.68 m	55.87 m ²	2.84 m

8.0 Living Area	14.83	m ²
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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
New	Cavity Wall	Cavity wall : dense plaster, dense block, filled cavity, any outside structure	0.17	190.00	210.20	172.86	0.00	None	37.34	Enter Gross Area

Description	Construction	Kappa (kJ/m ² K)	Area (m ²)
Internal Wall 1	Dense block, plasterboard on dabs	75.00	70.46
Internal Wall 2	Plasterboard on timber frame	9.00	129.50

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
Loft	External Plane Roof	Plasterboard, insulated at ceiling level	0.11	9.00	52.90	52.90	None	0.00	Enter Gross Area	0.00
Slope	External Slope Roof	Plasterboard, insulated slope	0.14	9.00	4.23	3.34	None	0.00	Enter Gross Area	0.89

Description	Storey	Construction	Kappa	Area (m ²)
Internal Ceiling 1	Lowest occupied	Plasterboard ceiling, carpeted chipboard floor	9.00	56.75

Description	Type	Storey Index	Construction	U-Value (W/m ² K)	Shelter Code	Shelter Factor	Kappa (kJ/m ² K)	Area (m ²)
New	Ground Floor - Solid	Lowest occupied	Suspended concrete floor, carpeted	0.11	None	0.00	75.00	56.75

11.2 Internal Floors

Summary for Input Data



Description	Storey Index	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Floor 2	+1	Plasterboard ceiling, carpeted chipboard floor	18.00	55.87

12.0 Opening Types

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

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
Opening	Door	New	West	1.91	
Opening	Windows	New	West	6.89	
Opening	Roof windows	Slope	West	0.89	44
Opening	Windows	New	North	14.63	
Opening	Door	New	North	1.99	
Opening	Windows	New	South	0.82	
Opening	Door	New	East	1.99	
Opening	Windows	New	East	9.12	

14.0 Conservatory

None

15.0 Draught Proofing

100

 %

16.0 Draught Lobby

No

17.0 Thermal Bridging

Calculate Bridges

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted Reference:	Imported
E2 Other lintels (including other steel lintels)	Independently assessed	19.10	0.23	0.23 RCD	No
E3 Sill	Independently assessed	15.25	0.02	0.02 RCD	No
E4 Jamb	Independently assessed	45.65	0.02	0.02 RCD	No
E5 Ground floor (normal)	Independently assessed	31.11	0.07	0.07 RCD	No
E6 Intermediate floor within a dwelling	Independently assessed	30.68	0.00	0.00 RCD	No
E10 Eaves (insulation at ceiling level)	Independently assessed	6.05	0.06	0.06 RCD	No
E11 Eaves (insulation at rafter level)	Independently assessed	6.05	0.02	0.02 RCD	No
E12 Gable (insulation at ceiling level)	Independently assessed	17.36	0.04	0.04 RCD	No
E13 Gable (insulation at rafter level)	Independently assessed	1.40	0.04	0.04 RCD	No
E16 Corner (normal)	Independently assessed	28.00	0.04	0.04 RCD	No
E17 Corner (inverted – internal area greater than external area)	Independently assessed	7.20	-0.08	-0.08 RCD	No
R1 Head of roof window	Table K1 - Default	0.75	0.24	0.24	No
R2 Sill of roof window	Table K1 - Default	0.75	0.24	0.24	No
R3 Jamb of roof window	Table K1 - Default	2.36	0.24	0.24	No
R11 Upstands or kerbs of rooflights	Table K1 - Default	3.86	0.24	0.24	No

Y-value

0.03

 W/m²K

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present

No

20.0 Fans, Open Fireplaces, Flues

Number of open chimneys	0
Number of open flues	0
Number of chimneys/flues attached to closed fire	0
Number of flues attached to solid fuel boiler	0
Number of flues attached to other heater	0
Number of blocked chimneys	0
Number of intermittent extract fans	5
Number of passive vents	0
Number of flueless gas fires	0

21.0 Fixed Cooling System

No

22.0 Pressure Testing

Yes

Designed AP₅₀

5.00

 m³/(h.m²) @ 50 Pa

Test Method

Blower Door

22.0 Lighting

No Fixed Lighting

No

Name	Efficacy	Power	Capacity	Count
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Summary for Input Data

Lighting 1 84.00 7.00 588.00 24

24.0 Main Heating 1

Database		
Percentage of Heat	100.00	%
Database Ref. No.	104633	
Fuel Type	Electricity	
In Winter	298.56	
In Summer	295.05	
Model Name	Ecodan 6.0 kW	
Manufacturer	Mitsubishi Electric Europe B.V.	
System Type	Heat Pump	
Controls SAP Code	2207	
Controls description	Time and temperature zone control by arrangement	
Is MHS Pumped	Pump in heated space	
Heating Pump Age	2013 or later	
Heat Emitter	Radiators and Underfloor	
Underfloor Heating	Yes - Pipes in thin screed	
Flow Temperature	Enter value	
Flow Temperature Value	45.00	

25.0 Main Heating 2

None

26.0 Heat Networks

None

27.0 Secondary Heating

None

28.0 Water Heating

Water Heating	Main Heating 1
SAP Code	901
Flue Gas Heat Recovery System	No
Waste Water Heat Recovery Instantaneous System 1	No
Waste Water Heat Recovery Instantaneous System 2	No
Waste Water Heat Recovery Storage System	No
Solar Panel	No
Water use <= 125 litres/person/day	Yes
Cold Water Source	From mains
Bath Count	1
Immersion Only Heating Hot Water	No

28.1 Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
Shower	Unknown	8.00		No	

28.3 Waste Water Heat Recovery System

29.0 Hot Water Cylinder

Hot Water Cylinder		
Cylinder Stat	Yes	
Cylinder In Heated Space	Yes	
Independent Time Control	Yes	
Insulation Type	Measured Loss	
Cylinder Volume	200.00	L
Loss	1.86	kWh/day
Pipes insulation	Fully insulated primary pipework	

31.0 Thermal Store

None

Summary for Input Data



Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

	Typical Cost	Typical savings per year	Ratings after improvement	
			SAP rating	Environmental Impact
Solar water heating			B 83	A 96
Photovoltaic	£8,000 - £10,000	£269	B 88	A 97
Wind turbine			0	0

Thermal Bridging

Plot Reference	01775	Issued on Date	08/01/2026
Assessment Reference	00001	Plot Type Ref	Detached House
Plot Address	Unit 3, 9, Circuit Lane, Reading, RG30 5HB	SAP Version	10.2

SAP Rating	82 B	DER	4.00	TER	13.23
Environmental	96 A	% DER < TER			69.77
CO ₂ Emissions (t/year)	0.4	DFEE	52.02	TFEE	52.17
Compliance Check	See BREL	% DFEE < TFEE			0.29
% DPER < TPER	40.39	DPER	41.44	TPER	69.51

Assessor Details	Mr. Matthew Carter	Assessor ID	7869-0001
Client	Simon Knight, Simon Knight		

	Junction details	Source Type	Psi (W/mK)	Length (m)	Result	Reference
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.234	19.10	4.47	RCD
External wall	E3 Sill	Independently assessed	0.023	15.25	0.35	RCD
External wall	E4 Jamb	Independently assessed	0.018	45.65	0.82	RCD
External wall	E5 Ground floor (normal)	Independently assessed	0.068	31.11	2.12	RCD
External wall	E6 Intermediate floor within a dwelling	Independently assessed	0.001	30.68	0.03	RCD
External wall	E10 Eaves (insulation at ceiling level)	Independently assessed	0.055	6.05	0.33	RCD
External wall	E11 Eaves (insulation at rafter level)	Independently assessed	0.018	6.05	0.11	RCD
External wall	E12 Gable (insulation at ceiling level)	Independently assessed	0.037	17.36	0.64	RCD
External wall	E13 Gable (insulation at rafter level)	Independently assessed	0.039	1.40	0.05	RCD
External wall	E16 Corner (normal)	Independently assessed	0.040	28.00	1.12	RCD
External wall	E17 Corner (inverted – internal area greater than external area)	Independently assessed	-0.082	7.20	-0.59	RCD
External roof	R1 Head of roof window	Table K1 - Default	0.240	0.75	0.18	
External roof	R2 Sill of roof window	Table K1 - Default	0.240	0.75	0.18	
External roof	R3 Jamb of roof window	Table K1 - Default	0.240	2.36	0.57	
External roof	R11 Upstands or kerbs of rooflights	Table K1 - Default	0.240	3.86	0.93	

Total: 215.57 W/mK:
Y-Value: 0.03 W/m²K: