

Building Regulations England Part L (BREL) Compliance Report

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

Date: Thu 04 Sep 2025 07:26:16

Project Information			
Assessed By	William Linley	Building Type	Flat, Semi-detached
OCDEA Registration	EES/013386	Assessment Date	2025-09-04

Dwelling Details			
Assessment Type	As designed	Total Floor Area	30 m ²
Site Reference	1a Eaton Place GF	Plot Reference	1a GF
Address	1a Eaton Place, RG1 7LP		

Client Details	
Name	Array
Company	Array
Address	

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	18.8 kgCO ₂ /m ²		
Dwelling carbon dioxide emission rate	8.17 kgCO ₂ /m ²		OK
1b Target primary energy rate and dwelling primary energy			
Target primary energy	100.01 kWh _{PE} /m ²		
Dwelling primary energy	84.69 kWh _{PE} /m ²		OK
1c Target fabric energy efficiency and dwelling fabric energy efficiency			
Target fabric energy efficiency	47.5 kWh/m ²		
Dwelling fabric energy efficiency	37.9 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	0	Party Wall (1) (0)	N/A
Curtain walls	1.6	0	N/A	N/A
Floors	0.18	0.11	Heat Loss Floor 1 (0.11)	OK
Roofs	0.16	N/A	N/A	N/A
Windows, doors, and roof windows	1.6	1.33	Front (1.4)	OK
Rooflights	2.2	N/A	N/A	N/A

2b Envelope elements (better than typically expected values are flagged with a subsequent (!))			
Name	Net area [m ²]	U-Value [W/m ² K]	
Exposed wall: Walls (1)	51.502	0.17	
Party wall: Party Wall (1)	9.34	0 (!)	
Ground floor: Heat Loss Floor 1, Heat Loss Floor 1	30.48	0.11	

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]
Front, Door	1.89	West	N/A	1.2
Front, Windows	1.599	West	0.7	1.4
Front, Windows	1.599	West	0.7	1.4

2d Thermal bridging (better than typically expected values are flagged with a subsequent (!))				
Building part 1: Thermal bridging calculated from linear thermal transmittances for each junction				
Main element	Junction detail	Source	Psi value [W/mK]	Drawing / reference
External wall	E2: Other lintels (including other steel lintels)	Calculated by person with suitable expertise	0.023 (!)	
External wall	E3: Sill	Calculated by person with suitable expertise	0.021 (!)	
External wall	E4: Jamb	Calculated by person with suitable expertise	0.016 (!)	

Main element	Junction detail	Source	Psi value [W/mK]	Drawing / reference
External wall	E5: Ground floor (normal)	Calculated by person with suitable expertise	0.058	
External wall	E7: Party floor between dwellings (in blocks of flats)	Calculated by person with suitable expertise	0.043	
External wall	E16: Corner (normal)	Calculated by person with suitable expertise	0.037 (!)	
External wall	E17: Corner (inverted - internal area greater than external area)	Calculated by person with suitable expertise	-0.068	
External wall	E18: Party wall between dwellings	Calculated by person with suitable expertise	0.043	
Party wall	P1: Ground floor	Calculated by person with suitable expertise	0.043	
Party wall	P3: Intermediate floor between dwellings (in blocks of flats)	SAP table default	0 (!)	

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

Maximum permitted air permeability at 50Pa	8 m ³ /hm ²	
Dwelling air permeability at 50Pa	4 m ³ /hm ² , Design value	OK
Air permeability test certificate reference		

4 Space heating

Main heating system 1: Room heaters - Electricity

Efficiency	100.0%
Emitter type	
Flow temperature	
System type	Panel, convector or radiant heaters
Manufacturer	
Model	
Commissioning	

Main heating system 2: Heat pump with radiators or underfloor heating - Electricity

Efficiency	0.0%
Emitter type	
Flow temperature	
System type	Heat Pump
Manufacturer	Auer
Model	EDL170-520RF
Commissioning	

Secondary heating system: N/A

Fuel	N/A
Efficiency	N/A
Commissioning	

5 Hot water

Cylinder/store - type: N/A

Capacity	N/A
Declared heat loss	N/A
Primary pipework insulated	N/A
Manufacturer	
Model	
Commissioning	

Waste water heat recovery system 1 - type: N/A

Efficiency	
Manufacturer	
Model	

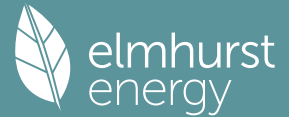
6 Controls

Main heating 1 - type: Programmer and appliance thermostats

Function	
Ecodesign class	
Manufacturer	
Model	

Main heating 2 - type: Not applicable		
Function		
Ecodesign class		
Manufacturer		
Model		
Water heating - type: N/A		
Manufacturer		
Model		
7 Lighting		
Minimum permitted light source efficacy	75 lm/W	
Lowest light source efficacy	75 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



Property Reference	1a Eaton Place GF				Issued on Date	04/09/2025	
Assessment Reference	1a GF			Prop Type Ref			
Property	1a Eaton Place, RG1 7LP						
SAP Rating	80 C		DER	8.17		TER	18.80
Environmental	96 A		% DER < TER				56.54
CO ₂ Emissions (t/year)	0.2		DFEE	37.95		TFEE	47.51
Compliance Check	See BREL		% DFEE < TFEE				20.13
% DPER < TPER	15.32		DPER	84.69		TPER	100.01
Assessor Details	Mr. William Linley					Assessor ID	P977-0001
Client	,						

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	30.4800 (1b)	2.4000 (2b)	73.1520 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	30.4800		73.1520 (4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 73.1520 (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	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.2734 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.4734 (18)
Number of sides sheltered	3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3669 (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	0.4678	0.4586	0.4494	0.4036	0.3944	0.3485	0.3485	0.3394	0.3669	0.3944	0.4127	0.4311 (22b)
Effective ac	0.6094	0.6052	0.6010	0.5814	0.5778	0.5607	0.5607	0.5576	0.5673	0.5778	0.5852	0.5929 (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			1.8900	1.2000	2.2680		(26)
Windows			3.2000	1.3258	4.2424		(27)
Heat Loss Floor 1			30.4800	0.1100	3.3528	110.0000	3352.8000 (28a)
Main	56.5920	5.0900	51.5020	0.1700	8.7553	60.0000	3090.1200 (29a)
Total net area of external elements Aum(A, m ²)			87.0720				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	18.6186		(33)
Main dwelling							
Party Wall 1			9.3400	0.0000	0.0000	45.0000	420.3000 (32)
Party Ceilings 1			30.4800			30.0000	914.4000 (32b)
Internal Wall 1			46.8000			75.0000	3510.0000 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	11287.6200 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							370.3287 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				3.3600	0.0230	0.0773	
E3 Sill				2.4600	0.0210	0.0517	
E4 Jamb				9.4000	0.0160	0.1504	
E5 Ground floor (normal)				23.5800	0.0580	1.3676	
E7 Party floor between dwellings (in blocks of flats)				23.5800	0.0430	1.0139	

Full SAP Calculation Printout



E16 Corner (normal)	7.2000	0.0370	0.2664										
E17 Corner (inverted - internal area greater than external area)	2.4000	-0.0680	-0.1632										
E18 Party wall between dwellings	4.8000	0.0430	0.2064										
P1 Party wall - Ground floor	3.8900	0.0430	0.1673										
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	3.8900	0.0000	0.0000										
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				3.1378 (36)									
Point Thermal bridges				(36a) = 0.0000									
Total fabric heat loss		(33) + (36) + (36a) =		21.7564 (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	14.7113	14.6087	14.5082	14.0360	13.9476	13.5364	13.5364	13.4602	13.6948	13.9476	14.1264	14.3132	(38)
Average = Sum(39)m / 12 =	36.4676	36.3650	36.2645	35.7923	35.7040	35.2927	35.2927	35.2166	35.4511	35.7040	35.8827	36.0696	(39)
												35.7919	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.1964	1.1931	1.1898	1.1743	1.1714	1.1579	1.1579	1.1554	1.1631	1.1714	1.1773	1.1834	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	
												1.1743	
												31	

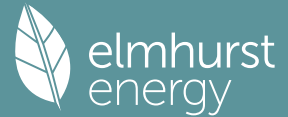
4. Water heating energy requirements (kWh/year)													
Assumed occupancy													1.1826 (42)
Hot water usage for mixer showers													
	63.5421	62.5872	61.1957	58.5333	56.5685	54.3774	53.1320	54.5130	56.0268	58.3794	61.0989	63.2986	(42a)
Hot water usage for baths													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42b)
Hot water usage for other uses													
	26.7406	25.7682	24.7958	23.8234	22.8511	21.8787	21.8787	22.8511	23.8234	24.7958	25.7682	26.7406	(42c)
Average daily hot water use (litres/day)													82.8933 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	90.2827	88.3554	85.9915	82.3567	79.4196	76.2561	75.0107	77.3640	79.8502	83.1752	86.8671	90.0392	(44)
Energy conte	142.9857	125.8169	132.1657	112.7423	106.9140	93.7658	90.7189	95.7928	98.4633	112.8679	123.7581	140.9797	(45)
Energy content (annual)										Total = Sum(45)m =		1376.9712	
Distribution loss (46)m = 0.15 x (45)m													
	21.4479	18.8725	19.8249	16.9113	16.0371	14.0649	13.6078	14.3689	14.7695	16.9302	18.5637	21.1470	(46)
Water storage loss:													
Store volume													173.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.9200 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													1.0368 (55)
Total storage loss													
	32.1408	29.0304	32.1408	31.1040	32.1408	31.1040	32.1408	32.1408	31.1040	32.1408	31.1040	32.1408	(56)
If cylinder contains dedicated solar storage													
	32.1408	29.0304	32.1408	31.1040	32.1408	31.1040	32.1408	32.1408	31.1040	32.1408	31.1040	32.1408	(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													
	175.1265	154.8473	164.3065	143.8463	139.0548	124.8698	122.8597	127.9336	129.5673	145.0087	154.8621	173.1205	(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													
	175.1265	154.8473	164.3065	143.8463	139.0548	124.8698	122.8597	127.9336	129.5673	145.0087	154.8621	173.1205	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		1755.4032	(64)
Electric shower(s)												1755	(64)
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000	(64a)
Heat gains from water heating, kWh/month													
	47.5427	41.8341	43.9451	37.4868	35.5489	31.1771	30.1640	31.8511	32.7390	37.5286	41.1496	46.8757	(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	59.1280	59.1280	59.1280	59.1280	59.1280	59.1280	59.1280	59.1280	59.1280	59.1280	59.1280	59.1280	(66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	56.7964	62.8818	56.7964	58.6896	56.7964	58.6896	56.7964	56.7964	58.6896	56.7964	58.6896	56.7964	(67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	98.5301	99.5525	96.9760	91.4910	84.5671	78.0596	73.7121	72.6897	75.2662	80.7513	87.6752	94.1827	(68)
Pumps, fans	28.9128	28.9128	28.9128	28.9128	28.9128	28.9128	28.9128	28.9128	28.9128	28.9128	28.9128	28.9128	(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)
	-47.3024	-47.3024	-47.3024	-47.3024	-47.3024	-47.3024	-47.3024	-47.3024	-47.3024	-47.3024	-47.3024	-47.3024	(71)
Water heating gains (Table 5)													
	63.9015	62.2531	59.0660	52.0650	47.7808	43.3016	40.5431	42.8106	45.4709	50.4416	57.1522	63.0050	(72)
Total internal gains													
	259.9664	265.4258	253.5768	242.9840	229.8827	220.7891	211.7900	213.0352	220.1651	228.7277	244.2554	254.7225	(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												
West	3.2000												20.1221 (80)
Solar gains	20.1221	39.3630	64.8253	94.5438	115.8670	118.6105	112.9220	96.9984	75.3945	46.7075	25.0898	16.5474	(83)
Total gains	280.0885	304.7888	318.4021	337.5278	345.7497	339.3996	324.7121	310.0335	295.5596	275.4353	269.3453	271.2699	(84)

7. Mean internal temperature (heating season)													

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Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	85.9790	86.2215	86.4605	87.6012	87.8179	88.8412	88.8412	89.0334	88.4443	87.8179	87.3805	86.9279
alpha	6.7319	6.7481	6.7640	6.8401	6.8545	6.9227	6.9227	6.9356	6.8963	6.8545	6.8254	6.7952
util living area	0.9971	0.9941	0.9865	0.9533	0.8544	0.6517	0.4767	0.5197	0.7777	0.9631	0.9931	0.9976 (86)
MIT	20.1651	20.2844	20.4634	20.7173	20.9069	20.9881	20.9987	20.9978	20.9625	20.7306	20.4129	20.1494 (87)
Th 2	19.9228	19.9255	19.9282	19.9406	19.9430	19.9538	19.9538	19.9558	19.9496	19.9430	19.9382	19.9333 (88)
util rest of house	0.9957	0.9913	0.9797	0.9301	0.7927	0.5524	0.3643	0.4035	0.6823	0.9397	0.9892	0.9965 (89)
MIT 2	18.9779	19.1315	19.3590	19.6759	19.8770	19.9490	19.9536	19.9554	19.9310	19.6993	19.3055	18.9661 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	19.5325	19.6701	19.8750	20.1624	20.3582	20.4345	20.4419	20.4424	20.4129	20.1811	19.8229	19.5190 (92)
Temperature adjustment												
adjusted MIT	19.5325	19.6701	19.8750	20.1624	20.3582	20.4345	20.4419	20.4424	20.4129	20.1811	19.8229	19.5190 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9950	0.9904	0.9793	0.9357	0.8189	0.5991	0.4170	0.4580	0.7268	0.9461	0.9886	0.9959 (94)
Useful gains	278.6992	301.8718	311.8047	315.8350	283.1467	203.3176	135.4034	142.0103	214.8179	260.5765	266.2829	270.1675 (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	555.4937	537.1170	485.0364	403.1082	309.1315	205.9140	135.5906	142.3594	223.7990	342.0839	456.5314	552.5480 (97)
Space heating kWh	205.9351	158.0848	128.8843	62.8367	19.3327	0.0000	0.0000	0.0000	0.0000	60.6415	136.9789	210.0912 (98a)
Space heating requirement - total per year (kWh/year)	982.7853											
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	205.9351	158.0848	128.8843	62.8367	19.3327	0.0000	0.0000	0.0000	0.0000	60.6415	136.9789	210.0912 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	982.7853											
Space heating per m2	(98c) / (4) = 32.2436 (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)
Fraction of main heating from main system 2													0.0000 (203)
Fraction of total heating from main system 1													1.0000 (204)
Fraction of total heating from main system 2													0.0000 (205)
Efficiency of main space heating system 1 (in %)													100.0000 (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	205.9351	158.0848	128.8843	62.8367	19.3327	0.0000	0.0000	0.0000	0.0000	60.6415	136.9789	210.0912 (98)	
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000 (210)	
Space heating fuel (main heating system)	205.9351	158.0848	128.8843	62.8367	19.3327	0.0000	0.0000	0.0000	0.0000	60.6415	136.9789	210.0912 (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)	
Space heating fuel used, main 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)	
Water heating													
Water heating requirement	175.1265	154.8473	164.3065	143.8463	139.0548	124.8698	122.8597	127.9336	129.5673	145.0087	154.8621	173.1205 (64)	
Efficiency of water heater	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550 (216)	
Fuel for water heating, kWh/month	57.8061	51.1123	54.2346	47.4811	45.8995	41.2173	40.5538	42.2286	42.7678	47.8648	51.1172	57.1440 (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	12.0745	9.6866	8.7218	6.3899	4.9358	4.0326	4.5026	5.8526	7.6020	9.9742	11.2658	12.4101 (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													982.7853 (211)
Space heating fuel - main system 2													0.0000 (213)
Space heating fuel - secondary													0.0000 (215)
Efficiency of water heater													302.9550
Water heating fuel used													579.4270 (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)													97.4485 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation													0.0000 (233)

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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	1659.6608 (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	982.7853	0.1560	153.2938 (261)
Space heating - main system 2	0.0000	0.0000	0.0000 (262)
Total CO2 associated with community systems			0.0000 (263)
Water heating (other fuel)	579.4270	0.1410	81.6844 (264)
Space and water heating			234.9782 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	97.4485	0.1443	14.0648 (268)
Total CO2, kg/year			249.0430 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			8.1700 (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	982.7853	1.5775	1550.3199 (275)
Space heating - main system 2	0.0000	0.0000	0.0000 (276)
Total CO2 associated with community systems			0.0000 (273)
Water heating (other fuel)	579.4270	1.5213	881.4684 (278)
Space and water heating			2431.7884 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	97.4485	1.5338	149.4698 (282)
Total Primary energy kWh/year			2581.2581 (286)
Dwelling Primary energy Rate (DPER)			84.6900 (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	30.4800 (1b)	x 2.4000 (2b)	= 73.1520 (1b) - (3b)
Ground floor			(4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	30.4800		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 73.1520 (5)
Dwelling volume			

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)

Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	Air changes per hour
Pressure test		20.0000 / (5) = 0.2734 (8)
Pressure Test Method		Yes
Measured/design AP50		Blower Door
Infiltration rate		5.0000 (17)
Number of sides sheltered		0.5234 (18)
		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.4056 (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	0.5172	0.5070	0.4969	0.4462	0.4361	0.3854	0.3854	0.3752	0.4056	0.4361	0.4563	0.4766 (22b)
Effective ac	0.6337	0.6285	0.6235	0.5995	0.5951	0.5742	0.5742	0.5704	0.5823	0.5951	0.6041	0.6136 (25)

3. Heat losses and heat loss parameter

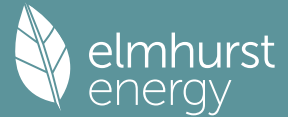
Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Main dwelling							
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type			3.2000	1.1450	3.6641		(27)

4. Water heating energy requirements (kWh/year)												
Assumed occupancy												1.1826 (42)
Hot water usage for mixer showers												
	56.4819	55.6330	54.3962	52.0296	50.2831	48.3355	47.2285	48.4560	49.8016	51.8928	54.3101	56.2655 (42a)
Hot water usage for baths												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42b)
Hot water usage for other uses												
	26.7406	25.7682	24.7958	23.8234	22.8511	21.8787	21.8787	22.8511	23.8234	24.7958	25.7682	26.7406 (42c)
Average daily hot water use (litres/day)												76.3840 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use												
	83.2225	81.4013	79.1920	75.8530	73.1342	70.2142	69.1071	71.3070	73.6250	76.6886	80.0784	83.0060 (44)
Energy content (annual)												
	131.8040	115.9143	121.7151	103.8390	98.4527	86.3365	83.5791	88.2930	90.7870	104.0657	114.0863	129.9674 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 1268.8401
	19.7706	17.3871	18.2573	15.5759	14.7679	12.9505	12.5369	13.2440	13.6181	15.6099	17.1129	19.4951 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (55)
Total storage loss												
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage												
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss												
	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month												
	178.3989	158.0000	168.3100	148.9309	145.0476	131.4284	130.1740	134.8879	135.8789	150.6606	159.1781	176.5623 (62)
VWHRs												
	-25.8211	-22.8364	-23.9130	-19.8009	-18.4537	-15.7910	-14.8015	-15.7400	-16.3380	-19.2607	-21.8200	-25.3430 (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												
	152.5778	135.1636	144.3970	129.1299	126.5938	115.6374	115.3725	119.1480	119.5409	131.3999	137.3581	151.2193 (64)
12Total per year (kWh/year)												Total per year (kWh/year) = Sum(64)m = 1577.5382 (64)
Electric shower(s)												1578 (64)
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000 (64a)
Heat gains from water heating, kWh/month												
	81.1008	72.2101	77.7462	70.5999	70.0114	64.7804	65.0660	66.6333	66.2602	71.8778	74.0072	80.4901 (65)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	59.1280	59.1280	59.1280	59.1280	59.1280	59.1280	59.1280	59.1280	59.1280	59.1280	59.1280	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	56.7964	62.8818	56.7964	58.6896	56.7964	58.6896	56.7964	56.7964	58.6896	56.7964	58.6896	56.7964 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	98.5301	99.5525	96.9760	91.4910	84.5671	78.0596	73.7121	72.6897	75.2662	80.7513	87.6752	94.1827 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	28.9128	28.9128	28.9128	28.9128	28.9128	28.9128	28.9128	28.9128	28.9128	28.9128	28.9128	28.9128 (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)	-47.3024	-47.3024	-47.3024	-47.3024	-47.3024	-47.3024	-47.3024	-47.3024	-47.3024	-47.3024	-47.3024	-47.3024 (71)
Water heating gains (Table 5)	109.0064	107.4555	104.4976	98.0555	94.1014	89.9727	87.4543	89.5610	92.0280	96.6099	102.7877	108.1856 (72)
Total internal gains	308.0713	313.6281	302.0084	291.9745	279.2033	267.4603	258.7012	259.7855	266.7222	277.8960	292.8909	302.9031 (73)

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[Jan]	Area m2				Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W		
West	3.2000				19.6403		0.6300		0.7000		0.7700		19.2074 (80)		
Solar gains	19.2074	37.5738	61.8787	90.2464	110.6003	113.2191	107.7892	92.5893	71.9675	44.5845	23.9494	15.7953	(83)		
Total gains	327.2787	351.2019	363.8871	382.2208	389.8036	380.6794	366.4904	352.3748	338.6897	322.4805	316.8403	318.6983	(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	84.1168	84.3729	84.6255	85.8322	86.0619	87.1471	87.1471	87.3511	86.7259	86.0619	85.5986	85.1196			
alpha	6.6078	6.6249	6.6417	6.7221	6.7375	6.8098	6.8098	6.8234	6.7817	6.7375	6.7066	6.6746			
util living area	0.9962	0.9930	0.9849	0.9513	0.8538	0.6551	0.4770	0.5163	0.7685	0.9549	0.9907	0.9968	(86)		
MIT	20.1717	20.2841	20.4600	20.7118	20.9026	20.9868	20.9986	20.9977	20.9631	20.7443	20.4285	20.1603	(87)		
Th 2	19.7980	19.8012	19.8043	19.8190	19.8218	19.8346	19.8346	19.8370	19.8297	19.8218	19.8162	19.8104	(88)		
util rest of house	0.9942	0.9892	0.9764	0.9245	0.7846	0.5440	0.3517	0.3876	0.6613	0.9242	0.9850	0.9951	(89)		
MIT 2	18.8783	19.0230	19.2460	19.5593	19.7572	19.8300	19.8344	19.8367	19.8134	19.6041	19.2184	18.8735	(90)		
Living area fraction	fLA = Living area / (4) = 0.4672 (91)														
MIT	19.4826	19.6122	19.8132	20.0977	20.2924	20.3704	20.3783	20.3791	20.3505	20.1368	19.7837	19.4747	(92)		
Temperature adjustment	0.0000														
adjusted MIT	19.4826	19.6122	19.8132	20.0977	20.2924	20.3704	20.3783	20.3791	20.3505	20.1368	19.7837	19.4747	(93)		
8. Space heating requirement															
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
Utilisation	0.9934	0.9885	0.9765	0.9319	0.8147	0.5964	0.4104	0.4481	0.7118	0.9340	0.9848	0.9944	(94)		
Useful gains	325.1332	347.1524	355.3460	356.1921	317.5894	227.0316	150.4148	157.8845	241.0845	301.2074	312.0259	316.9201	(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	627.0572	605.7859	546.5439	453.2356	346.8536	230.0381	150.6231	158.2553	250.3866	384.9777	514.7842	623.4288	(97)		
Space heating kWh	224.6315	173.8017	142.2512	69.8713	21.7725	0.0000	0.0000	0.0000	0.0000	62.3251	145.9860	228.0425	(98a)		
Space heating requirement - total per year (kWh/year)													1068.6819		
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	224.6315	173.8017	142.2512	69.8713	21.7725	0.0000	0.0000	0.0000	0.0000	62.3251	145.9860	228.0425	(98c)		
Space heating requirement after solar contribution - total per year (kWh/year)													1068.6819		
Space heating per m2											(98c) / (4) =		35.0617 (99)		
9a. Energy requirements - Individual heating systems, including micro-CHP															
Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)		
Fraction of space heat from main system(s)													1.0000 (202)		
Efficiency of main space heating system 1 (in %)													92.3000 (206)		
Efficiency of main space heating system 2 (in %)													0.0000 (207)		
Efficiency of secondary/supplementary heating system, %													0.0000 (208)		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
Space heating requirement	224.6315	173.8017	142.2512	69.8713	21.7725	0.0000	0.0000	0.0000	0.0000	62.3251	145.9860	228.0425	(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)	243.3711	188.3009	154.1184	75.7002	23.5889	0.0000	0.0000	0.0000	0.0000	67.5245	158.1647	247.0666	(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	152.5778	135.1636	144.3970	129.1299	126.5938	115.6374	115.3725	119.1480	119.5409	131.3999	137.3581	151.2193	(64)		
Efficiency of water heater	84.9257	84.6247	84.0262	82.7445	81.0048	79.8000	79.8000	79.8000	79.8000	82.4897	84.1966	79.8000	(216)		
Fuel for water heating, kWh/month	179.6602	159.7212	171.8476	156.0586	156.2794	144.9090	144.5770	149.3082	149.8006	159.2925	163.1397	177.9498	(219)		
Space cooling fuel requirement															
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)		
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)		
Lighting	11.8012	9.4673	8.5243	6.2453	4.8240	3.9413	4.4006	5.7201	7.4299	9.7484	11.0108	12.1292	(232)		
Electricity generated by PVs (Appendix M) (negative quantity)															
(233a)m	-14.9954	-21.5280	-31.5275	-36.1822	-39.7119	-37.4018	-37.0293	-34.6672	-30.5272	-25.0402	-16.6563	-12.9265	(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	-7.3189	-15.5211	-31.0539	-46.9067	-62.2338	-62.5320	-61.7090	-52.0755	-38.0008	-22.1836	-9.7753	-5.7712	(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													1157.8352	(211)	
Space heating fuel - main system 2													0.0000	(213)	

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Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	79.8000
Water heating fuel used	1912.5439 (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)	95.2422 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-753.2752 (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	2498.3462 (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	1157.8352	0.2100	243.1454 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1912.5439	0.2100	401.6342 (264)
Space and water heating			644.7796 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	95.2422	0.1443	13.7464 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-338.1933	0.1341	-45.3615
PV Unit electricity exported	-415.0819	0.1258	-52.2019
Total			-97.5634 (269)
Total CO2, kg/year			572.8919 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			18.8000 (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	1157.8352	1.1300	1308.3538 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1912.5439	1.1300	2161.1746 (278)
Space and water heating			3469.5284 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	95.2422	1.5338	146.0857 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-338.1933	1.4957	-505.8330
PV Unit electricity exported	-415.0819	0.4616	-191.6154
Total			-697.4484 (283)
Total Primary energy kWh/year			3048.2665 (286)
Target Primary Energy Rate (TPER)			100.0100 (287)

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

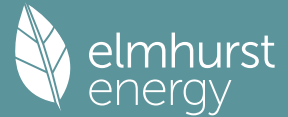
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	30.4800 (1b)	2.4000 (2b)	73.1520 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	30.4800		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	73.1520 (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	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.2734 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.4734 (18)
Number of sides sheltered	3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3669 (21)

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Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 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	0.4678	0.4586	0.4494	0.4036	0.3944	0.3485	0.3485	0.3394	0.3669	0.3944	0.4127	0.4311	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)													(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =													(23c)
Effective ac	0.6094	0.6052	0.6010	0.5814	0.5778	0.5607	0.5607	0.5576	0.5673	0.5778	0.5852	0.5929	(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			1.8900	1.2000	2.2680			(26)
Windows			3.2000	1.3258	4.2424			(27)
Heat Loss Floor 1			30.4800	0.1100	3.3528	110.0000	3352.8000	(28a)
Main	56.5920	5.0900	51.5020	0.1700	8.7553	60.0000	3090.1200	(29a)
Total net area of external elements Aum(A, m2)			87.0720					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	18.6186		(33)
Main dwelling								
Party Wall 1			9.3400	0.0000	0.0000	45.0000	420.3000	(32)
Party Ceilings 1			30.4800			70.0000	2133.6000	(32b)
Internal Wall 1			46.8000			75.0000	3510.0000	(32c)
Heat capacity Cm = Sum(A x k)								(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								(35)
List of Thermal Bridges								
K1 Element				Length	Psi-value		Total	
E2 Other lintels (including other steel lintels)				3.3600	0.0230		0.0773	
E3 Sill				2.4600	0.0210		0.0517	
E4 Jamb				9.4000	0.0160		0.1504	
E5 Ground floor (normal)				23.5800	0.0580		1.3676	
E7 Party floor between dwellings (in blocks of flats)				23.5800	0.0430		1.0139	
E16 Corner (normal)				7.2000	0.0370		0.2664	
E17 Corner (inverted - internal area greater than external area)				2.4000	-0.0680		-0.1632	
E18 Party wall between dwellings				4.8000	0.0430		0.2064	
P1 Party wall - Ground floor				3.8900	0.0430		0.1673	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)				3.8900	0.0000		0.0000	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								3.1378 (36)
Point Thermal bridges								0.0000
Total fabric heat loss								(33) + (36) + (36a) = 21.7564 (37)

List of thermal bridges												
K1 Element									Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)									3.3600	0.0230	0.0773	
E3 Sill									2.4600	0.0210	0.0517	
E4 Jamb									9.4000	0.0160	0.1504	
E5 Ground floor (normal)									23.5800	0.0580	1.3676	
E7 Party floor between dwellings (in blocks of flats)									23.5800	0.0430	1.0139	
E16 Corner (normal)									7.2000	0.0370	0.2664	
E17 Corner (inverted - internal area greater than external area)									2.4000	-0.0680	-0.1632	
E18 Party wall between dwellings									4.8000	0.0430	0.2064	
P1 Party wall - Ground floor									3.8900	0.0430	0.1673	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)									3.8900	0.0000	0.0000	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)												3.1378 (36)
Point Thermal bridges											(36a) =	0.0000
Total fabric heat loss											(33) + (36) + (36a) =	21.7564 (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
	14.7113	14.6087	14.5082	14.0360	13.9476	13.5364	13.5364	13.4602	13.6948	13.9476	14.1264	14.3132 (38)
Heat transfer coeff	36.4676	36.3650	36.2645	35.7923	35.7040	35.2927	35.2927	35.2166	35.4511	35.7040	35.8827	36.0696 (39)
Average = Sum(39)m / 12 =												35.7919
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	1.1964	1.1931	1.1898	1.1743	1.1714	1.1579	1.1579	1.1554	1.1631	1.1714	1.1773	1.1834 (40)
HLP (average)												1.1743
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

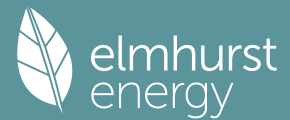
4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.1826 (42)
Hot water usage for mixer showers													(42a)
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
Hot water usage for baths													(42b)
	19.0649	18.7817	18.3830	17.6478	17.0974	16.4870	16.1572	16.5532	16.9843	17.6374	18.3877	19.0004	
Hot water usage for other uses													(42c)
	26.7406	25.7682	24.7958	23.8234	22.8511	21.8787	21.8787	22.8511	23.8234	24.7958	25.7682	26.7406	
Average daily hot water use (litres/day)													(43)
Daily hot water use	Jan 45.8055	Feb 44.5499	Mar 43.1788	Apr 41.4713	May 39.9484	Jun 38.3656	Jul 38.0359	Aug 39.4042	Sep 40.8077	Oct 42.4333	Nov 44.1559	Dec 45.7410	(44)
Energy conte	72.5447	63.4385	66.3643	56.7721	53.7782	47.1750	46.0011	48.7907	50.3200	57.5815	62.9082	71.6194	(45)
Energy content (annual)										Total = Sum(45)m =		697.2937	
Distribution loss (46)m = 0.15 x (45)m													(46)
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
Water storage loss:													
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													
	61.6630	53.9227	56.4096	48.2563	45.7115	40.0988	39.1010	41.4721	42.7720	48.9443	53.4720	60.8765	(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	61.6630	53.9227	56.4096	48.2563	45.7115	40.0988	39.1010	41.4721	42.7720	48.9443	53.4720	60.8765	(64)
Total per year (kWh/year) = Sum(64)m =													592.6997 (64)
12Total per year (kWh/year)													593 (64)
Electric shower(s)													
	35.2743	31.4297	34.3200	32.7512	33.3657	31.8277	32.8886	33.3657	32.7512	34.3200	33.6747	35.2743	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =													401.2429 (64a)
Heat gains from water heating, kWh/month													
	24.2343	21.3381	22.6824	20.2519	19.7693	17.9816	17.9974	18.7094	18.8808	20.8161	21.7867	24.0377	(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	59.1280	59.1280	59.1280	59.1280	59.1280	59.1280	59.1280	59.1280	59.1280	59.1280	59.1280	59.1280	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	56.7964	62.8818	56.7964	58.6896	56.7964	58.6896	56.7964	58.6896	56.7964	58.6896	56.7964	58.6896	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	98.5301	99.5525	96.9760	91.4910	84.5671	78.0596	73.7121	72.6897	75.2662	80.7513	87.6752	94.1827	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	28.9128	28.9128	28.9128	28.9128	28.9128	28.9128	28.9128	28.9128	28.9128	28.9128	28.9128	28.9128	(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)	-47.3024	-47.3024	-47.3024	-47.3024	-47.3024	-47.3024	-47.3024	-47.3024	-47.3024	-47.3024	-47.3024	-47.3024	(71)
Water heating gains (Table 5)	32.5730	31.7531	30.4871	28.1276	26.5716	24.9745	24.1900	25.1471	26.2233	27.9786	30.2593	32.3087	(72)
Total internal gains	228.6379	234.9258	224.9979	219.0466	208.6735	202.4620	195.4370	195.3716	200.9176	206.2647	217.3625	224.0262	(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

West				3.2000	19.6403	0.6600		0.7000		0.7700		20.1221 (80)

Solar gains	20.1221	39.3630	64.8253	94.5438	115.8670	118.6105	112.9220	96.9984	75.3945	46.7075	25.0898	16.5474 (83)
Total gains	248.7600	274.2888	289.8232	313.5904	324.5405	321.0725	308.3590	292.3700	276.3121	252.9722	242.4523	240.5736 (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	95.2658	95.5345	95.7993	97.0631	97.3033	98.4372	98.4372	98.6500	97.9973	97.3033	96.8187	96.3172	
alpha	7.3511	7.3690	7.3866	7.4709	7.4869	7.5625	7.5625	7.5767	7.5332	7.4869	7.4546	7.4211	
util living area	0.9992	0.9980	0.9945	0.9736	0.8920	0.6881	0.5022	0.5512	0.8225	0.9813	0.9976	0.9994	(86)
MIT	20.1635	20.2762	20.4481	20.7026	20.9009	20.9885	20.9990	20.9981	20.9596	20.7135	20.4024	20.1503	(87)
Th 2	19.9228	19.9255	19.9282	19.9406	19.9430	19.9538	19.9538	19.9558	19.9496	19.9430	19.9382	19.9333	(88)
util rest of house	0.9987	0.9969	0.9911	0.9573	0.8348	0.5841	0.3837	0.4279	0.7269	0.9663	0.9960	0.9990	(89)
MIT 2	19.1772	19.2918	19.4643	19.7196	19.8885	19.9505	19.9537	19.9556	19.9345	19.7355	19.4284	19.1729	(90)
Living area fraction	19.6380	19.7517	19.9239	20.1789	20.3615	20.4355	20.4421	20.4426	20.4134	20.1924	19.8835	19.6295	(91)
MIT	19.6380	19.7517	19.9239	20.1789	20.3615	20.4355	20.4421	20.4426	20.4134	20.1924	19.8835	19.6295	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6380	19.7517	19.9239	20.1789	20.3615	20.4355	20.4421	20.4426	20.4134	20.1924	19.8835	19.6295	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	248.4019	273.3695	287.2458	301.5692	279.0431	203.3203	135.4444	142.0534	213.3958	245.5625	241.4619	240.3028	(94)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(95)
Heat loss rate W	559.3399	540.0835	486.8126	403.6974	309.2509	205.9490	135.5967	142.3672	223.8171	342.4868	458.7051	556.5361	(97)
Space heating kWh	231.3379	179.2318	148.4776	73.5323	22.4746	0.0000	0.0000	0.0000	0.0000	72.1117	156.4151	235.2776	(98a)
Space heating requirement - total per year (kWh/year)												1118.8586	
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	231.3379	179.2318	148.4776	73.5323	22.4746	0.0000	0.0000	0.0000	0.0000	72.1117	156.4151	235.2776	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1118.8586	
Space heating per m2										(98c) / (4) =		36.7080	(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	331.7517	261.1662	267.6460	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9076	0.9640	0.9468	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	301.1136	251.7515	253.4177	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	352.0155	338.4937	320.9227	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	36.6494	64.5362	50.2238	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	9.1623	16.1341	12.5559	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												37.8523	(107)
Energy for space heating												36.7080	(99)
Energy for space cooling												1.2419	(108)
Total												37.9498	(109)
Fabric Energy Efficiency (DFEE)												37.9	(109)

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1. Overall dwelling characteristics

Main dwelling		Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor		30.4800 (1b)	x 2.4000 (2b)	= 73.1520 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	30.4800			(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	73.1520 (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												2 * 10 = 20.0000 (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) =										20.0000 / (5) =	0.2734 (8)
Pressure test	Yes											
Pressure Test Method	Blower Door											
Measured/design AP50	5.0000 (17)											
Infiltration rate	0.5234 (18)											
Number of sides sheltered	3 (19)											
Shelter factor	(20) = 1 - [0.075 x (19)] =										0.7750 (20)	
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =										0.4056 (21)	
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
	0.5172	0.5070	0.4969	0.4462	0.4361	0.3854	0.3854	0.3752	0.4056	0.4361	0.4563	0.4766 (22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.6337	0.6285	0.6235	0.5995	0.5951	0.5742	0.5742	0.5704	0.5823	0.5951	0.6041	0.6136 (25)

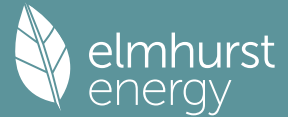
3. Heat losses and heat loss parameter

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			1.8900	1.0000	1.8900		(26)					
TER Opening Type			3.2000	1.1450	3.6641		(27)					
Heat Loss Floor 1			30.4800	0.1300	3.9624		(28a)					
Main	56.5920	5.0900	51.5020	0.1800	9.2704		(29a)					
Total net area of external elements Aum(A, m2)			87.0720				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	18.7869	(33)					
Main dwelling												
Party Wall 1			9.3400	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							410.3287 (35)					
List of Thermal Bridges												
K1 Element				Length	Psi-value	Total						
E2 Other lintels (including other steel lintels)				3.3600	0.0500	0.1680						
E3 Sill				2.4600	0.0500	0.1230						
E4 Jamb				9.4000	0.0500	0.4700						
E5 Ground floor (normal)				23.5800	0.1600	3.7728						
E7 Party floor between dwellings (in blocks of flats)				23.5800	0.0700	1.6506						
E16 Corner (normal)				7.2000	0.0900	0.6480						
E17 Corner (inverted - internal area greater than external area)				2.4000	-0.0900	-0.2160						
E18 Party wall between dwellings				4.8000	0.0600	0.2880						
P1 Party wall - Ground floor				3.8900	0.0800	0.3112						
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)				3.8900	0.0000	0.0000						
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.2156 (36)					
Point Thermal Bridges						(36a) =	0.0000					
Total fabric heat loss						(33) + (36) + (36a) =	26.0025 (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	15.2986	15.1733	15.0504	14.4732	14.3652	13.8625	13.8625	13.7694	14.0561	14.3652	14.5837	14.8120 (38)
Average = Sum(39)m / 12 =	41.3011	41.1757	41.0529	40.4757	40.3677	39.8650	39.8650	39.7719	40.0586	40.3677	40.5861	40.8145 (39)
												40.4751
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.3550	1.3509	1.3469	1.3279	1.3244	1.3079	1.3079	1.3049	1.3143	1.3244	1.3316	1.3391 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.1826 (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												
	19.0649	18.7817	18.3830	17.6478	17.0974	16.4870	16.1572	16.5532	16.9843	17.6374	18.3877	19.0004 (42b)
Hot water usage for other uses												
	26.7406	25.7682	24.7958	23.8234	22.8511	21.8787	21.8787	22.8511	23.8234	24.7958	25.7682	26.7406 (42c)

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Average daily hot water use (litres/day)												41.9858 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	45.8055	44.5499	43.1788	41.4713	39.9484	38.3656	38.0359	39.4042	40.8077	42.4333	44.1559	45.7410 (44)
Energy content (annual)	72.5447	63.4385	66.3643	56.7721	53.7782	47.1750	46.0011	48.7907	50.3200	57.5815	62.9082	71.6194 (45)
Distribution loss (46)m = 0.15 x (45)m												697.2937
Water storage loss:	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
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	61.6630	53.9227	56.4096	48.2563	45.7115	40.0988	39.1010	41.4721	42.7720	48.9443	53.4720	60.8765 (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	61.6630	53.9227	56.4096	48.2563	45.7115	40.0988	39.1010	41.4721	42.7720	48.9443	53.4720	60.8765 (64)
12Total per year (kWh/year)												592.6997 (64)
Electric shower(s)	35.2743	31.4297	34.3200	32.7512	33.3657	31.8277	32.8886	33.3657	32.7512	34.3200	33.6747	35.2743 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												401.2429 (64a)
Heat gains from water heating, kWh/month	24.2343	21.3381	22.6824	20.2519	19.7693	17.9816	17.9974	18.7094	18.8808	20.8161	21.7867	24.0377 (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	59.1280	59.1280	59.1280	59.1280	59.1280	59.1280	59.1280	59.1280	59.1280	59.1280	59.1280	59.1280 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	56.7964	62.8818	56.7964	58.6896	56.7964	58.6896	56.7964	56.7964	58.6896	56.7964	58.6896	56.7964 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	98.5301	99.5525	96.9760	91.4910	84.5671	78.0596	73.7121	72.6897	75.2662	80.7513	87.6752	94.1827 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	28.9128	28.9128	28.9128	28.9128	28.9128	28.9128	28.9128	28.9128	28.9128	28.9128	28.9128	28.9128 (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)	-47.3024	-47.3024	-47.3024	-47.3024	-47.3024	-47.3024	-47.3024	-47.3024	-47.3024	-47.3024	-47.3024	-47.3024 (71)
Water heating gains (Table 5)	32.5730	31.7531	30.4871	28.1276	26.5716	24.9745	24.1900	25.1471	26.2233	27.9786	30.2593	32.3087 (72)
Total internal gains	228.6379	234.9258	224.9979	219.0466	208.6735	202.4620	195.4370	195.3716	200.9176	206.2647	217.3625	224.0262 (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			
West				3.2000	19.6403	0.6300	0.7000	0.7700	19.2074 (80)			
Solar gains	19.2074	37.5738	61.8787	90.2464	110.6003	113.2191	107.7892	92.5893	71.9675	44.5845	23.9494	15.7953 (83)
Total gains	247.8453	272.4996	286.8766	309.2930	319.2738	315.6811	303.2262	287.9610	272.8850	250.8492	241.3119	239.8215 (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	84.1168	84.3729	84.6255	85.8322	86.0619	87.1471	87.1471	87.3511	86.7259	86.0619	85.5986	85.1196
alpha	6.6078	6.6249	6.6417	6.7221	6.7375	6.8098	6.8098	6.8234	6.7817	6.7375	6.7066	6.6746
util living area	0.9993	0.9984	0.9959	0.9827	0.9297	0.7633	0.5725	0.6245	0.8770	0.9872	0.9981	0.9994 (86)
MIT	19.9933	20.1094	20.2943	20.5755	20.8204	20.9676	20.9959	20.9929	20.9151	20.6065	20.2617	19.9824 (87)
Th 2	19.7980	19.8012	19.8043	19.8190	19.8218	19.8346	19.8346	19.8370	19.8297	19.8218	19.8162	19.8104 (88)
util rest of house	0.9988	0.9974	0.9934	0.9709	0.8820	0.6471	0.4245	0.4732	0.7852	0.9760	0.9967	0.9991 (89)
MIT 2	18.9041	19.0225	19.2089	19.4954	19.7161	19.8246	19.8341	19.8360	19.7948	19.5305	19.1869	18.9033 (90)
Living area fraction												0.4672 (91)
MIT	19.4129	19.5303	19.7160	20.0000	20.2320	20.3586	20.3769	20.3765	20.3182	20.0332	19.6890	19.4075 (92)
Temperature adjustment												0.0000
adjusted MIT	19.4129	19.5303	19.7160	20.0000	20.2320	20.3586	20.3769	20.3765	20.3182	20.0332	19.6890	19.4075 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9987	0.9971	0.9931	0.9732	0.9013	0.7025	0.4944	0.5450	0.8285	0.9787	0.9965	0.9989 (94)
Ext temp.	247.5109	271.7190	284.8987	300.9949	287.7557	221.7611	149.9184	156.9468	226.0777	245.4955	240.4775	239.5635 (95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Space heating kWh	624.1807	602.4126	542.5542	449.2797	344.4166	229.5654	150.5656	158.1524	249.0929	380.7965	510.9395	620.6855 (97)
Space heating requirement - total per year (kWh/year)	280.2423	222.2261	191.6957	106.7651	42.1557	0.0000	0.0000	0.0000	0.0000	100.6640	194.7327	283.5547 (98a)
Solar heating kWh												1422.0363
Solar heating contribution - total per year (kWh/year)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Space heating kWh												0.0000

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280.2423 222.2261 191.6957 106.7651 42.1557 0.0000 0.0000 0.0000 0.0000 100.6640 194.7327 283.5547 (98c)
 Space heating requirement after solar contribution - total per year (kWh/year) 1422.0363
 Space heating per m2 (98c) / (4) = 46.6547 (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	374.7306	295.0007	302.2661	0.0000	0.0000	0.0000	0.0000 (100)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.8342	0.9178	0.8904	0.0000	0.0000	0.0000	0.0000 (101)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	312.6108	270.7439	269.1409	0.0000	0.0000	0.0000	0.0000 (102)
Space cooling kWh												
Cooled fraction	0.0000	0.0000	0.0000	0.0000	0.0000	23.8342	45.9423	34.6916	0.0000	0.0000	0.0000	0.0000 (104)
Intermittency factor (Table 10b)									fC = cooled area / (4) =			1.0000 (105)
Space cooling kWh	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (106)
Space cooling requirement	0.0000	0.0000	0.0000	0.0000	0.0000	5.9586	11.4856	8.6729	0.0000	0.0000	0.0000	0.0000 (107)
Energy for space heating												26.1170 (107)
Energy for space cooling												46.6547 (99)
Total												0.8569 (108)
Fabric Energy Efficiency (TFEE)												47.5116 (109)
												47.5 (109)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	30.4800	2.4000	73.1520
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	30.4800	x	73.1520 (1b) - (3b)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	73.1520 (4)

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	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)

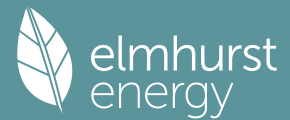
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.2734 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	4.0000	(17)
Infiltration rate	0.4734	(18)
Number of sides sheltered	3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3669 (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	0.4678	0.4586	0.4494	0.4036	0.3944	0.3485	0.3485	0.3394	0.3669	0.3944	0.4127	0.4311 (22b)
Effective ac	0.6094	0.6052	0.6010	0.5814	0.5778	0.5607	0.5607	0.5576	0.5673	0.5778	0.5852	0.5929 (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			1.8900	1.2000	2.2680		(26)
Windows			3.2000	1.3258	4.2424		(27)
Heat Loss Floor 1			30.4800	0.1100	3.3528	110.0000	3352.8000 (28a)
Main	56.5920	5.0900	51.5020	0.1700	8.7553	60.0000	3090.1200 (29a)
Total net area of external elements Aum(A, m2)			87.0720				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		18.6186		(33)
Main dwelling							
Party Wall 1			9.3400	0.0000	0.0000	45.0000	420.3000 (32)
Party Ceilings 1			30.4800			70.0000	2133.6000 (32b)
Internal Wall 1			46.8000			75.0000	3510.0000 (32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		12506.8200 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							410.3287 (35)
List of Thermal Bridges							

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K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	3.3600	0.0230	0.0773
E3 Sill	2.4600	0.0210	0.0517
E4 Jamb	9.4000	0.0160	0.1504
E5 Ground floor (normal)	23.5800	0.0580	1.3676
E7 Party floor between dwellings (in blocks of flats)	23.5800	0.0430	1.0139
E16 Corner (normal)	7.2000	0.0370	0.2664
E17 Corner (inverted - internal area greater than external area)	2.4000	-0.0680	-0.1632
E18 Party wall between dwellings	4.8000	0.0430	0.2064
P1 Party wall - Ground floor	3.8900	0.0430	0.1673
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	3.8900	0.0000	0.0000
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			3.1378 (36)
Point Thermal Bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	21.7564 (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	14.7113	14.6087	14.5082	14.0360	13.9476	13.5364	13.5364	13.4602	13.6948	13.9476	14.1264	14.3132	(38)
Heat transfer coeff	36.4676	36.3650	36.2645	35.7923	35.7040	35.2927	35.2927	35.2166	35.4511	35.7040	35.8827	36.0696	(39)
Average = Sum(39)m / 12 =												35.7919	
HLP	1.1964	1.1931	1.1898	1.1743	1.1714	1.1579	1.1579	1.1554	1.1631	1.1714	1.1773	1.1834	(40)
HLP (average)												1.1743	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.1826 (42)
Hot water usage for mixer showers	63.5421	62.5872	61.1957	58.5333	56.5685	54.3774	53.1320	54.5130	56.0268	58.3794	61.0989	63.2986	(42a)
Hot water usage for baths	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42b)
Hot water usage for other uses	26.7406	25.7682	24.7958	23.8234	22.8511	21.8787	21.8787	22.8511	23.8234	24.7958	25.7682	26.7406	(42c)
Average daily hot water use (litres/day)												82.8933	(43)
Daily hot water use	90.2827	88.3554	85.9915	82.3567	79.4196	76.2561	75.0107	77.3640	79.8502	83.1752	86.8671	90.0392	(44)
Energy conte	142.9857	125.8169	132.1657	112.7423	106.9140	93.7658	90.7189	95.7928	98.4633	112.8679	123.7581	140.9797	(45)
Energy content (annual)												1376.9712	
Distribution loss (46)m = 0.15 x (45)m	21.4479	18.8725	19.8249	16.9113	16.0371	14.0649	13.6078	14.3689	14.7695	16.9302	18.5637	21.1470	(46)
Water storage loss:													
Store volume												173.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.9200	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												1.0368	(55)
Total storage loss	32.1408	29.0304	32.1408	31.1040	32.1408	31.1040	32.1408	32.1408	31.1040	32.1408	31.1040	32.1408	(56)
If cylinder contains dedicated solar storage	32.1408	29.0304	32.1408	31.1040	32.1408	31.1040	32.1408	32.1408	31.1040	32.1408	31.1040	32.1408	(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	175.1265	154.8473	164.3065	143.8463	139.0548	124.8698	122.8597	127.9336	129.5673	145.0087	154.8621	173.1205	(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	175.1265	154.8473	164.3065	143.8463	139.0548	124.8698	122.8597	127.9336	129.5673	145.0087	154.8621	173.1205	(64)
												1755.4032	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
												0.0000	(64a)
Heat gains from water heating, kWh/month	47.5427	41.8341	43.9451	37.4868	35.5489	31.1771	30.1640	31.8511	32.7390	37.5286	41.1496	46.8757	(65)

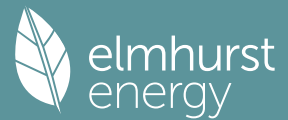
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	70.9536	70.9536	70.9536	70.9536	70.9536	70.9536	70.9536	70.9536	70.9536	70.9536	70.9536	70.9536	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.7948	12.2525	9.9644	7.5437	5.6390	4.7607	5.1441	6.6865	8.9745	11.3952	13.2999	14.1782	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	147.0598	148.5859	144.7403	136.5537	126.2195	116.5068	110.0181	108.4921	112.3376	120.5243	130.8585	140.5712	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	43.2779	43.2779	43.2779	43.2779	43.2779	43.2779	43.2779	43.2779	43.2779	43.2779	43.2779	43.2779	(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)	-47.3024	-47.3024	-47.3024	-47.3024	-47.3024	-47.3024	-47.3024	-47.3024	-47.3024	-47.3024	-47.3024	-47.3024	(71)
Water heating gains (Table 5)	63.9015	62.2531	59.0660	52.0650	47.7808	43.3016	40.5431	42.8106	45.4709	50.4416	57.1522	63.0050	(72)
Total internal gains	291.6853	290.0206	280.6998	263.0915	246.5684	231.4981	222.6344	224.9183	233.7122	249.2903	268.2397	284.6836	(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		
West				3.2000	19.6403		0.6600		0.7000		0.7700		20.1221 (80)
Solar gains	20.1221	39.3630	64.8253	94.5438	115.8670	118.6105	112.9220	96.9984	75.3945	46.7075	25.0898	16.5474	(83)
Total gains	311.8074	329.3836	345.5251	357.6353	362.4354	350.1086	335.5564	321.9167	309.1067	295.9978	293.3296	301.2310	(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	95.2658	95.5345	95.7993	97.0631	97.3033	98.4372	98.4372	98.6500	97.9973	97.3033	96.8187	96.3172
alpha	7.3511	7.3690	7.3866	7.4709	7.4869	7.5625	7.5625	7.5767	7.5332	7.4869	7.4546	7.4211
util living area	0.9964	0.9936	0.9841	0.9480	0.8401	0.6366	0.4620	0.5018	0.7586	0.9565	0.9920	0.9972 (86)
MIT	20.3077	20.4006	20.5685	20.7812	20.9358	20.9930	20.9994	20.9990	20.9764	20.7947	20.5167	20.2897 (87)
Th 2	19.9228	19.9255	19.9282	19.9406	19.9430	19.9538	19.9538	19.9558	19.9496	19.9430	19.9382	19.9333 (88)
util rest of house	0.9946	0.9903	0.9756	0.9210	0.7733	0.5373	0.3527	0.3888	0.6596	0.9278	0.9872	0.9957 (89)
MIT 2	19.1497	19.2695	19.4815	19.7442	19.9010	19.9514	19.9537	19.9557	19.9392	19.7668	19.4275	19.1353 (90)
Living area fraction	fLA = Living area / (4) = 0.4672 (91)											
MIT	19.6907	19.7979	19.9893	20.2287	20.3845	20.4380	20.4423	20.4431	20.4238	20.2470	19.9364	19.6746 (92)
Temperature adjustment	0.0000											
adjusted MIT	19.6907	19.7979	19.9893	20.2287	20.3845	20.4380	20.4423	20.4431	20.4238	20.2470	19.9364	19.6746 (93)
8. Space heating requirement												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9941	0.9898	0.9762	0.9295	0.8032	0.5841	0.4039	0.4418	0.7063	0.9375	0.9872	0.9952 (94)
Useful gains	309.9523	326.0315	337.2989	332.4105	291.0962	204.4850	135.5190	142.2193	218.3290	277.5045	289.5604	299.7970 (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	561.2627	541.7639	489.1838	405.4800	310.0710	206.0400	135.6045	142.3837	224.1848	344.4379	460.6036	558.1627 (97)
Space heating kWh	186.9749	144.9722	113.0023	52.6100	14.1172	0.0000	0.0000	0.0000	0.0000	49.7984	123.1511	192.2241 (98a)
Space heating requirement - total per year (kWh/year)	876.8503											
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	186.9749	144.9722	113.0023	52.6100	14.1172	0.0000	0.0000	0.0000	0.0000	49.7984	123.1511	192.2241 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	876.8503											
Space heating per m2	(98c) / (4) = 28.7681 (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)											
Fraction of main heating from main system 2	0.0000 (203)											
Fraction of total heating from main system 1	1.0000 (204)											
Fraction of total heating from main system 2	0.0000 (205)											
Efficiency of main space heating system 1 (in %)	100.0000 (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	186.9749	144.9722	113.0023	52.6100	14.1172	0.0000	0.0000	0.0000	0.0000	49.7984	123.1511	192.2241 (98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000 (210)
Space heating fuel (main heating system)	186.9749	144.9722	113.0023	52.6100	14.1172	0.0000	0.0000	0.0000	0.0000	49.7984	123.1511	192.2241 (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)
Space heating fuel used, main system 2	0.0000 (213)											
Water heating												
Water heating requirement	175.1265	154.8473	164.3065	143.8463	139.0548	124.8698	122.8597	127.9336	129.5673	145.0087	154.8621	173.1205 (64)
Efficiency of water heater (217)m	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550 (216)
Fuel for water heating, kWh/month	57.8061	51.1123	54.2346	47.4811	45.8995	41.2173	40.5538	42.2286	42.7678	47.8648	51.1172	57.1440 (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	12.0745	9.6866	8.7218	6.3899	4.9358	4.0326	4.5026	5.8526	7.6020	9.9742	11.2658	12.4101 (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	876.8503 (211)											
Space heating fuel - main system 2	0.0000 (213)											
Space heating fuel - secondary	0.0000 (215)											
Efficiency of water heater	302.9550											
Water heating fuel used	579.4270 (219)											
Space cooling fuel	0.0000 (221)											
Electricity for pumps and fans:												

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Total electricity for the above, kWh/year	0.0000 (231)
Electricity for lighting (calculated in Appendix L)	97.4485 (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	1553.7258 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	876.8503	16.4900	144.5926 (240)
Space heating - main system 2	0.0000	16.4900	0.0000 (241)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	579.4270	16.4900	95.5475 (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	97.4485	16.4900	16.0693 (250)
Additional standing charges			0.0000 (251)
Total energy cost			256.2094 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):	0.3600 (256)
Energy cost factor (ECF)	1.2220 (257)
SAP value	80.1916
SAP rating (Section 12)	80 (258)
SAP band	C

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	876.8503	0.1563	137.0495 (261)
Space heating - main system 2	0.0000	0.0000	0.0000 (262)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	579.4270	0.1410	81.6844 (264)
Space and water heating			218.7338 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	97.4485	0.1443	14.0648 (268)
Total CO2, kg/year			232.7987 (272)
CO2 emissions per m2			7.6400 (273)
EI value			95.8671
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

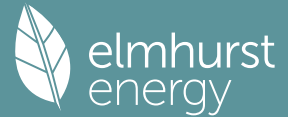
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	30.4800	2.4000	73.1520
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	30.4800		
Dwelling volume			73.1520

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	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	20.0000 / (5) = 0.2734 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.4734 (18)
Number of sides sheltered	3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.7750 (20)

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Infiltration rate adjusted to include shelter factor

(21) = (18) x (20) = 0.3669 (21)

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind factor	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Adj infilt rate	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Effective ac	0.3944	0.3761	0.3761	0.3485	0.3577	0.3119	0.3119	0.3027	0.3119	0.3485	0.3394	0.3669	(22b)
	0.5778	0.5707	0.5707	0.5607	0.5640	0.5486	0.5486	0.5458	0.5486	0.5607	0.5576	0.5673	(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			1.8900	1.2000	2.2680			(26)
Windows			3.2000	1.3258	4.2424			(27)
Heat Loss Floor 1			30.4800	0.1100	3.3528	110.0000	3352.8000	(28a)
Main	56.5920	5.0900	51.5020	0.1700	8.7553	60.0000	3090.1200	(29a)
Total net area of external elements Aum(A, m2)			87.0720					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	18.6186			(33)
Main dwelling								
Party Wall 1			9.3400	0.0000	0.0000	45.0000	420.3000	(32)
Party Ceilings 1			30.4800			70.0000	2133.6000	(32b)
Internal Wall 1			46.8000			75.0000	3510.0000	(32c)

Heat capacity Cm = Sum(A x k)

(28)...(30) + (32) + (32a)...(32e) = 12506.8200 (34)

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

410.3287 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	3.3600	0.0230	0.0773
E3 Sill	2.4600	0.0210	0.0517
E4 Jamb	9.4000	0.0160	0.1504
E5 Ground floor (normal)	23.5800	0.0580	1.3676
E7 Party floor between dwellings (in blocks of flats)	23.5800	0.0430	1.0139
E16 Corner (normal)	7.2000	0.0370	0.2664
E17 Corner (inverted - internal area greater than external area)	2.4000	-0.0680	-0.1632
E18 Party wall between dwellings	4.8000	0.0430	0.2064
P1 Party wall - Ground floor	3.8900	0.0430	0.1673
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	3.8900	0.0000	0.0000

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

3.1378 (36)

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 21.7564 (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	13.9476	13.7770	13.7770	13.5364	13.6146	13.2439	13.2439	13.1759	13.2439	13.5364	13.4602	13.6948	(38)
Average = Sum(39)m / 12 =	35.7040	35.5334	35.5334	35.2927	35.3709	35.0003	35.0003	34.9323	35.0003	35.2927	35.2166	35.4511	(39)
												35.2773	

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.1714	1.1658	1.1658	1.1579	1.1605	1.1483	1.1483	1.1461	1.1483	1.1579	1.1554	1.1631	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.1826 (42)
Hot water usage for mixer showers													
63.5421	62.5872	61.1957	58.5333	56.5685	54.3774	53.1320	54.5130	56.0268	58.3794	61.0989	63.2986	63.2986	(42a)
Hot water usage for baths													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42b)
Hot water usage for other uses													
26.7406	25.7682	24.7958	23.8234	22.8511	21.8787	21.8787	22.8511	23.8234	24.7958	25.7682	26.7406	26.7406	(42c)
Average daily hot water use (litres/day)													82.8933 (43)

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
90.2827	88.3554	85.9915	82.3567	79.4196	76.2561	75.0107	77.3640	79.8502	83.1752	86.8671	90.0392	90.0392	(44)
Energy conte	142.9857	125.8169	132.1657	112.7423	106.9140	93.7658	90.7189	95.7928	98.4633	112.8679	123.7581	140.9797	(45)
Energy content (annual)													Total = Sum(45)m = 1376.9712
Distribution loss (46)m = 0.15 x (45)m													
21.4479	18.8725	19.8249	16.9113	16.0371	14.0649	13.6078	14.3689	14.7695	16.9302	18.5637	21.1470	21.1470	(46)

Water storage loss:

Store volume

173.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day):

1.9200 (48)

Temperature factor from Table 2b

0.5400 (49)

Enter (49) or (54) in (55)

1.0368 (55)

Total storage loss

32.1408 29.0304 32.1408 31.1040 32.1408 31.1040 32.1408 32.1408 31.1040 32.1408 31.1040 32.1408 32.1408 (56)

If cylinder contains dedicated solar storage

32.1408 29.0304 32.1408 31.1040 32.1408 31.1040 32.1408 32.1408 31.1040 32.1408 31.1040 32.1408 32.1408 (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 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 0.0000 (61)

Total heat required for water heating calculated for each month

175.1265 154.8473 164.3065 143.8463 139.0548 124.8698 122.8597 127.9336 129.5673 145.0087 154.8621 173.1205 173.1205 (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 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 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 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 0.0000 (63d)

Output from w/h 175.1265 154.8473 164.3065 143.8463 139.0548 124.8698 122.8597 127.9336 129.5673 145.0087 154.8621 173.1205 173.1205 (64)

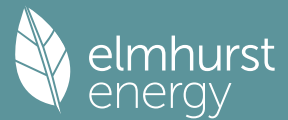
Electric shower(s) 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month 47.5427 41.8341 43.9451 37.4868 35.5489 31.1771 30.1640 31.8511 32.7390 37.5286 41.1496 46.8757 46.8757 (65)

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

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Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	70.9536	70.9536	70.9536	70.9536	70.9536	70.9536	70.9536	70.9536	70.9536	70.9536	70.9536	70.9536	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.7948	12.2525	9.9644	7.5437	5.6390	4.7607	5.1441	6.6865	8.9745	11.3952	13.2999	14.1782	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	147.0598	148.5859	144.7403	136.5537	126.2195	116.5068	110.0181	108.4921	112.3376	120.5243	130.8585	140.5712	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	43.2779	43.2779	43.2779	43.2779	43.2779	43.2779	43.2779	43.2779	43.2779	43.2779	43.2779	43.2779	(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)	-47.3024	-47.3024	-47.3024	-47.3024	-47.3024	-47.3024	-47.3024	-47.3024	-47.3024	-47.3024	-47.3024	-47.3024	(71)
Water heating gains (Table 5)	63.9015	62.2531	59.0660	52.0650	47.7808	43.3016	40.5431	42.8106	45.4709	50.4416	57.1522	63.0050	(72)
Total internal gains	291.6853	290.0206	280.6998	263.0915	246.5684	231.4981	222.6344	224.9183	233.7122	249.2903	268.2397	284.6836	(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
West				3.2000	23.8018		0.6600		0.7000		0.7700		24.3857 (80)
Solar gains	24.3857	41.6668	67.9990	100.4212	119.6877	129.5174	122.1226	107.7006	84.2186	53.0371	29.9520	20.1691 (83)	
Total gains	316.0710	331.6874	348.6988	363.5127	366.2561	361.0156	344.7569	332.6189	317.9307	302.3274	298.1917	304.8526 (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	97.3033	97.7705	97.7705	98.4372	98.2196	99.2597	99.2597	99.4530	99.2597	98.4372	98.6500	97.9973		
alpha	7.4869	7.5180	7.5180	7.5625	7.5480	7.6173	7.6173	7.6302	7.6173	7.5625	7.5767	7.5332		
util living area	0.9944	0.9904	0.9745	0.9135	0.7518	0.5028	0.3350	0.3570	0.6507	0.9235	0.9861	0.9955	(86)	
MIT	20.4102	20.4988	20.6658	20.8608	20.9740	20.9989	21.0000	20.9999	20.9927	20.8693	20.6181	20.3937	(87)	
Th 2	19.9430	19.9475	19.9475	19.9538	19.9518	19.9616	19.9616	19.9634	19.9616	19.9538	19.9558	19.9496	(88)	
util rest of house	0.9915	0.9852	0.9608	0.8723	0.6686	0.4032	0.2296	0.2482	0.5437	0.8773	0.9775	0.9931	(89)	
MIT 2	19.2960	19.4110	19.6162	19.8409	19.9382	19.9613	19.9616	19.9634	19.9592	19.8547	19.5681	19.2808	(90)	
Living area fraction	19.8166	19.9192	20.1066	20.3174	20.4221	20.4460	20.4467	20.4476	20.4421	20.3287	20.0586	19.8007	(91)	
MIT	19.8166	19.9192	20.1066	20.3174	20.4221	20.4460	20.4467	20.4476	20.4421	20.3287	20.0586	19.8007	(92)	
Temperature adjustment												0.0000		
adjusted MIT	19.8166	19.9192	20.1066	20.3174	20.4221	20.4460	20.4467	20.4476	20.4421	20.3287	20.0586	19.8007	(93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Useful gains	0.9910	0.9851	0.9633	0.8882	0.7074	0.4499	0.2788	0.2990	0.5942	0.8961	0.9785	0.9926	(94)	
Ext temp.	313.2306	326.7360	335.9012	322.8561	259.0878	162.4073	96.1311	99.4678	188.9130	270.9124	291.7868	302.6017	(95)	
Heat loss rate W	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)	
Space heating kWh	525.4401	505.2576	451.5090	367.6580	266.0639	162.6130	96.1353	99.4748	190.4737	311.5889	424.6631	521.1583	(97)	
Space heating requirement - total per year (kWh/year)	157.8839	119.9665	86.0122	32.2574	5.1903	0.0000	0.0000	0.0000	0.0000	30.2633	95.6709	162.6061	(98a)	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)	
Solar heating contribution - total per year (kWh/year)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98c)	
Space heating kWh	157.8839	119.9665	86.0122	32.2574	5.1903	0.0000	0.0000	0.0000	0.0000	30.2633	95.6709	162.6061	(98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												689.8506	(99)	
Space heating per m2												22.6329	(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)
Fraction of main heating from main system 2													0.0000	(203)
Fraction of total heating from main system 1													1.0000	(204)
Fraction of total heating from main system 2													0.0000	(205)
Efficiency of main space heating system 1 (in %)													100.0000	(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		
Space heating efficiency (main heating system 1)	157.8839	119.9665	86.0122	32.2574	5.1903	0.0000	0.0000	0.0000	0.0000	30.2633	95.6709	162.6061	(98)	
Space heating fuel (main heating system)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)	
Space heating efficiency (main heating system 2)	157.8839	119.9665	86.0122	32.2574	5.1903	0.0000	0.0000	0.0000	0.0000	30.2633	95.6709	162.6061	(211)	
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	(212)	
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	(213)	
Space heating fuel used, main 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	(215)	
Water heating														
Water heating requirement	175.1265	154.8473	164.3065	143.8463	139.0548	124.8698	122.8597	127.9336	129.5673	145.0087	154.8621	173.1205	(64)	
Efficiency of water heater												302.9550	(216)	

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(217)m	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	(217)
Fuel for water heating, kWh/month	57.8061	51.1123	54.2346	47.4811	45.8995	41.2173	40.5538	42.2286	42.7678	47.8648	51.1172	57.1440	(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	12.0745	9.6866	8.7218	6.3899	4.9358	4.0326	4.5026	5.8526	7.6020	9.9742	11.2658	12.4101	(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												689.8506	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												302.9550	
Water heating fuel used												579.4270	(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)												97.4485	(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												1366.7261	(238)

10a. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	689.8506	28.4300	196.1245	(240)
Space heating - main system 2	0.0000	28.4300	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	579.4270	28.4300	164.7311	(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	97.4485	28.4300	27.7046	(250)
Additional standing charges			0.0000	(251)
Total energy cost			388.5602	(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	689.8506	0.1572	108.4544	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	579.4270	0.1410	81.6844	(264)
Space and water heating			190.1388	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	97.4485	0.1443	14.0648	(268)
Total CO2, kg/year			204.2036	(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	689.8506	1.5820	1091.3670	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	579.4270	1.5213	881.4684	(278)
Space and water heating			1972.8354	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	97.4485	1.5338	149.4698	(282)
Total Primary energy kWh/year			2122.3052	(286)

SAP 10 EPC IMPROVEMENTS

1a GF

Current energy efficiency rating:	C 80
Current environmental impact rating:	A 96

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

Full SAP Calculation Printout



Recommended measures: SAP change Cost change CO2 change
(none)

Recommended measures Typical annual savings Energy Environmental
(none) efficiency impact
Total Savings £0 0.00 kg/m²

Potential energy efficiency rating: C 80
Potential environmental impact rating: A 96

Fuel prices for cost data on this page from database revision number 577 TEST (01 Aug 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

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

	Current	Potential	Saving
Electricity	£389	£389	£0
Space heating	£196	£196	£0
Water heating	£165	£165	£0
Lighting	£28	£28	£0
Total cost of fuels	£389	£389	£0
Total cost of uses	£389	£389	£0
Delivered energy	45 kWh/m²	45 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.2 tonnes	0.2 tonnes	0.0 tonnes
CO2 emissions per m²	7 kg/m²	7 kg/m²	0 kg/m²
Primary energy	70 kWh/m²	70 kWh/m²	0 kWh/m²

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	30.4800 (1b)	x 2.4000 (2b)	= 73.1520 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	30.4800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	73.1520 (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	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)

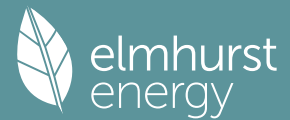
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.2734 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		4.0000 (17)
Infiltration rate		0.4734 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3669 (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	0.4678	0.4586	0.4494	0.4036	0.3944	0.3485	0.3485	0.3394	0.3669	0.3944	0.4127	0.4311 (22b)
Effective ac	0.6094	0.6052	0.6010	0.5814	0.5778	0.5607	0.5607	0.5576	0.5673	0.5778	0.5852	0.5929 (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			1.8900	1.2000	2.2680		(26)
Windows			3.2000	1.3258	4.2424		(27)
Heat Loss Floor 1			30.4800	0.1100	3.3528	110.0000	3352.8000 (28a)
Main	56.5920	5.0900	51.5020	0.1700	8.7553	60.0000	3090.1200 (29a)
Total net area of external elements Aum (A, m2)			87.0720				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		18.6186		(33)
Main dwelling							
Party Wall 1			9.3400	0.0000	0.0000	45.0000	420.3000 (32)
Party Ceilings 1			30.4800			70.0000	2133.6000 (32b)
Internal Wall 1			46.8000			75.0000	3510.0000 (32c)

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Heat capacity Cm = Sum(A x k)												(28)...(30) + (32) + (32a)...(32e) =	12506.8200 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K													410.3287 (35)
List of Thermal Bridges													
K1 Element									Length	Psi-value	Total		
E2 Other lintels (including other steel lintels)									3.3600	0.0230	0.0773		
E3 Sill									2.4600	0.0210	0.0517		
E4 Jamb									9.4000	0.0160	0.1504		
E5 Ground floor (normal)									23.5800	0.0580	1.3676		
E7 Party floor between dwellings (in blocks of flats)									23.5800	0.0430	1.0139		
E16 Corner (normal)									7.2000	0.0370	0.2664		
E17 Corner (inverted - internal area greater than external area)									2.4000	-0.0680	-0.1632		
E18 Party wall between dwellings									4.8000	0.0430	0.2064		
P1 Party wall - Ground floor									3.8900	0.0430	0.1673		
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)									3.8900	0.0000	0.0000		
Thermal bridges (Sum(L x Psi) calculated using Appendix K)													3.1378 (36)
Point Thermal bridges													(36a) = 0.0000
Total fabric heat loss													(33) + (36) + (36a) = 21.7564 (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	
	14.7113	14.6087	14.5082	14.0360	13.9476	13.5364	13.5364	13.4602	13.6948	13.9476	14.1264	14.3132	(38)
Heat transfer coeff													
	36.4676	36.3650	36.2645	35.7923	35.7040	35.2927	35.2927	35.2166	35.4511	35.7040	35.8827	36.0696	(39)
Average = Sum(39)m / 12 =												35.7919	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	1.1964	1.1931	1.1898	1.1743	1.1714	1.1579	1.1579	1.1554	1.1631	1.1714	1.1773	1.1834	(40)
HLP (average)												1.1743	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)													

Assumed occupancy													1.1826 (42)
Hot water usage for mixer showers													
	63.5421	62.5872	61.1957	58.5333	56.5685	54.3774	53.1320	54.5130	56.0268	58.3794	61.0989	63.2986	(42a)
Hot water usage for baths													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42b)
Hot water usage for other uses													
	26.7406	25.7682	24.7958	23.8234	22.8511	21.8787	21.8787	22.8511	23.8234	24.7958	25.7682	26.7406	(42c)
Average daily hot water use (litres/day)													82.8933 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	90.2827	88.3554	85.9915	82.3567	79.4196	76.2561	75.0107	77.3640	79.8502	83.1752	86.8671	90.0392	(44)
Energy conte	142.9857	125.8169	132.1657	112.7423	106.9140	93.7658	90.7189	95.7928	98.4633	112.8679	123.7581	140.9797	(45)
Energy content (annual)										Total = Sum(45)m =		1376.9712	
Distribution loss (46)m = 0.15 x (45)m													
	21.4479	18.8725	19.8249	16.9113	16.0371	14.0649	13.6078	14.3689	14.7695	16.9302	18.5637	21.1470	(46)
Water storage loss:													
Store volume													173.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.9200 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													1.0368 (55)
Total storage loss													
	32.1408	29.0304	32.1408	31.1040	32.1408	31.1040	32.1408	32.1408	31.1040	32.1408	31.1040	32.1408	(56)
If cylinder contains dedicated solar storage													
	32.1408	29.0304	32.1408	31.1040	32.1408	31.1040	32.1408	32.1408	31.1040	32.1408	31.1040	32.1408	(57)
Primary loss													0.0000 (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	(59)
Combi loss													0.0000 (61)
	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													
	175.1265	154.8473	164.3065	143.8463	139.0548	124.8698	122.8597	127.9336	129.5673	145.0087	154.8621	173.1205	(62)
WWHRS													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	(63a)
PV diverter													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	(63b)
Solar input													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	(63c)
FGHRS													0.0000 (63d)
	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													
	175.1265	154.8473	164.3065	143.8463	139.0548	124.8698	122.8597	127.9336	129.5673	145.0087	154.8621	173.1205	(64)
Total per year (kWh/year) = Sum(64)m =													1755.4032 (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													
	47.5427	41.8341	43.9451	37.4868	35.5489	31.1771	30.1640	31.8511	32.7390	37.5286	41.1496	46.8757	(65)

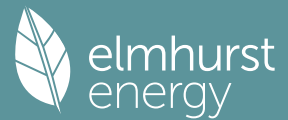
5. Internal gains (see Table 5 and 5a)													

Metabolic gains (Table 5), Watts													
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	70.9536	70.9536	70.9536	70.9536	70.9536	70.9536	70.9536	70.9536	70.9536	70.9536	70.9536	70.9536	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	13.7948	12.2525	9.9644	7.5437	5.6390	4.7607	5.1441	6.6865	8.9745	11.3952	13.2999	14.1782	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	147.0598	148.5859	144.7403	136.5537	126.2195	116.5068	110.0181	108.4921	112.3376	120.5243	130.8585	140.5712	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	43.2779	43.2779	43.2779	43.2779	43.2779	43.2779	43.2779	43.2779	43.2779	43.2779	43.2779	43.2779	(69)
Pumps, fans													0.0000 (70)
	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)													
	-47.3024	-47.3024	-47.3024	-47.3024	-47.3024	-47.3024	-47.3024	-47.3024	-47.3024	-47.3024	-47.3024	-47.3024	(71)
Water heating gains (Table 5)													
	63.9015	62.2531	59.0660	52.0650	47.7808	43.3016	40.5431	42.8106	45.4709	50.4416	57.1522	63.0050	(72)
Total internal gains													284.6836 (73)
	291.6853	290.0206	280.6998	263.0915	246.5684	231.4981	222.6344	224.9183	233.7122	249.2903	268.2397	284.6836	(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		
West			3.2000		19.6403		0.6600		0.7000		0.7700		20.1221 (80)

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Solar gains	20.1221	39.3630	64.8253	94.5438	115.8670	118.6105	112.9220	96.9984	75.3945	46.7075	25.0898	16.5474 (83)
Total gains	311.8074	329.3836	345.5251	357.6353	362.4354	350.1086	335.5564	321.9167	309.1067	295.9978	293.3296	301.2310 (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	95.2658	95.5345	95.7993	97.0631	97.3033	98.4372	98.4372	98.6500	97.9973	97.3033	96.8187	96.3172
alpha	7.3511	7.3690	7.3866	7.4709	7.4869	7.5625	7.5625	7.5767	7.5332	7.4869	7.4546	7.4211
util living area	0.9964	0.9936	0.9841	0.9480	0.8401	0.6366	0.4620	0.5018	0.7586	0.9565	0.9920	0.9972 (86)
MIT	20.3077	20.4006	20.5685	20.7812	20.9358	20.9930	20.9994	20.9990	20.9764	20.7947	20.5167	20.2897 (87)
Th 2	19.9228	19.9255	19.9282	19.9406	19.9430	19.9538	19.9538	19.9538	19.9496	19.9430	19.9382	19.9382 (88)
util rest of house	0.9946	0.9903	0.9756	0.9210	0.7733	0.5373	0.3527	0.3888	0.6596	0.9278	0.9872	0.9957 (89)
MIT 2	19.1497	19.2695	19.4815	19.7442	19.9010	19.9514	19.9537	19.9557	19.9392	19.7668	19.4275	19.1353 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	19.6907	19.7979	19.9893	20.2287	20.3845	20.4380	20.4423	20.4431	20.4238	20.2470	19.9364	19.6746 (92)
Temperature adjustment	0.0000											
adjusted MIT	19.6907	19.7979	19.9893	20.2287	20.3845	20.4380	20.4423	20.4431	20.4238	20.2470	19.9364	19.6746 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9941	0.9898	0.9762	0.9295	0.8032	0.5841	0.4039	0.4418	0.7063	0.9375	0.9872	0.9952 (94)
Useful gains	309.9523	326.0315	337.2989	332.4105	291.0962	204.4850	135.5190	142.2193	218.3290	277.5045	289.5604	299.7970 (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	561.2627	541.7639	489.1838	405.4800	310.0710	206.0400	135.6045	142.3837	224.1848	344.4379	460.6036	558.1627 (97)
Space heating kWh	186.9749	144.9722	113.0023	52.6100	14.1172	0.0000	0.0000	0.0000	0.0000	49.7984	123.1511	192.2241 (98a)
Space heating requirement - total per year (kWh/year)	876.8503											
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	186.9749	144.9722	113.0023	52.6100	14.1172	0.0000	0.0000	0.0000	0.0000	49.7984	123.1511	192.2241 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	876.8503											
Space heating per m2	(98c) / (4) = 28.7681 (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)											
Fraction of main heating from main system 2	0.0000 (203)											
Fraction of total heating from main system 1	1.0000 (204)											
Fraction of total heating from main system 2	0.0000 (205)											
Efficiency of main space heating system 1 (in %)	100.0000 (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	186.9749	144.9722	113.0023	52.6100	14.1172	0.0000	0.0000	0.0000	0.0000	49.7984	123.1511	192.2241 (98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000 (210)
Space heating fuel (main heating system)	186.9749	144.9722	113.0023	52.6100	14.1172	0.0000	0.0000	0.0000	0.0000	49.7984	123.1511	192.2241 (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)
Space heating fuel used, main 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)
Water heating												
Water heating requirement	175.1265	154.8473	164.3065	143.8463	139.0548	124.8698	122.8597	127.9336	129.5673	145.0087	154.8621	173.1205 (64)
Efficiency of water heater (217)m	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550 (216)
Fuel for water heating, kWh/month	57.8061	51.1123	54.2346	47.4811	45.8995	41.2173	40.5538	42.2286	42.7678	47.8648	51.1172	57.1440 (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	12.0745	9.6866	8.7218	6.3899	4.9358	4.0326	4.5026	5.8526	7.6020	9.9742	11.2658	12.4101 (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	876.8503 (211)											
Space heating fuel - main system 2	0.0000 (213)											
Space heating fuel - secondary	0.0000 (215)											
Efficiency of water heater	302.9550											
Water heating fuel used	579.4270 (219)											

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Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
Total electricity for the above, kWh/year	0.0000 (231)
Electricity for lighting (calculated in Appendix L)	97.4485 (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	1553.7258 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	876.8503	16.4900	144.5926	(240)
Space heating - main system 2	0.0000	16.4900	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	579.4270	16.4900	95.5475	(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	97.4485	16.4900	16.0693	(250)
Additional standing charges			0.0000	(251)
Total energy cost			256.2094	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):	0.3600 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] = 1.2220$ (257)
SAP value	80.1916
SAP rating (Section 12)	80 (258)
SAP band	C

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	876.8503	0.1563	137.0495	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	579.4270	0.1410	81.6844	(264)
Space and water heating			218.7338	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	97.4485	0.1443	14.0648	(268)
Total CO2, kg/year			232.7987	(272)
CO2 emissions per m2			7.6400	(273)
EI value			95.8671	
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 FOR IMPROVED DWELLING

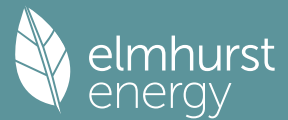
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)	
Main dwelling	30.4800	2.4000	73.1520	(1b) - (3b)
Ground floor				(4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	30.4800			
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	73.1520	(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	2 * 10 = 20.0000	(7a)
Number of passive vents	0 * 10 = 0.0000	(7b)
Number of flueless gas fires	0 * 40 = 0.0000	(7c)
Infiltration due to chimneys, flues and fans	$= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) = 20.0000 / (5) = 0.2734$	(8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	4.0000	(17)
Infiltration rate	0.4734	(18)

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Number of sides sheltered

3 (19)

Shelter factor

$$(20) = 1 - [0.075 \times (19)] = 0.7750 \quad (20)$$

Infiltration rate adjusted to include shelter factor

$$(21) = (18) \times (20) = 0.3669 \quad (21)$$

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate													
Effective ac	0.3944	0.3761	0.3761	0.3485	0.3577	0.3119	0.3119	0.3027	0.3119	0.3485	0.3394	0.3669	(22b)
	0.5778	0.5707	0.5707	0.5607	0.5640	0.5486	0.5486	0.5458	0.5486	0.5607	0.5576	0.5673	(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			1.8900	1.2000	2.2680			(26)
Windows			3.2000	1.3258	4.2424			(27)
Heat Loss Floor 1			30.4800	0.1100	3.3528	110.0000	3352.8000	(28a)
Main	56.5920	5.0900	51.5020	0.1700	8.7553	60.0000	3090.1200	(29a)
Total net area of external elements Aum(A, m2)			87.0720					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	18.6186		(33)
Main dwelling								
Party Wall 1			9.3400	0.0000	0.0000	45.0000	420.3000	(32)
Party Ceilings 1			30.4800			70.0000	2133.6000	(32b)
Internal Wall 1			46.8000			75.0000	3510.0000	(32c)

Heat capacity Cm = Sum(A x k)

$$(28)...(30) + (32) + (32a)...(32e) = 12506.8200 \quad (34)$$

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

$$410.3287 \quad (35)$$

List of Thermal Bridges

	Length	Psi-value	Total	
K1 Element	3.3600	0.0230	0.0773	
E2 Other lintels (including other steel lintels)	2.4600	0.0210	0.0517	
E3 Sill	9.4000	0.0160	0.1504	
E4 Jamb	23.5800	0.0580	1.3676	
E5 Ground floor (normal)	23.5800	0.0430	1.0139	
E7 Party floor between dwellings (in blocks of flats)	7.2000	0.0370	0.2664	
E16 Corner (normal)	2.4000	-0.0680	-0.1632	
E17 Corner (inverted - internal area greater than external area)	4.8000	0.0430	0.2064	
E18 Party wall between dwellings	3.8900	0.0430	0.1673	
P1 Party wall - Ground floor	3.8900	0.0000	0.0000	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)				
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				3.1378 (36)
Point Thermal bridges				0.0000
Total fabric heat loss				(33) + (36) + (36a) = 21.7564 (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	13.9476	13.7770	13.7770	13.5364	13.6146	13.2439	13.2439	13.1759	13.2439	13.5364	13.4602	13.6948	(38)
Heat transfer coeff	35.7040	35.5334	35.5334	35.2927	35.3709	35.0003	35.0003	34.9323	35.0003	35.2927	35.2166	35.4511	(39)
Average = Sum(39)m / 12 =												35.2773	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1714	1.1658	1.1658	1.1579	1.1605	1.1483	1.1483	1.1461	1.1483	1.1579	1.1554	1.1631	(40)
HLP (average)												1.1574	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.1826 (42)
Hot water usage for mixer showers													
63.5421	62.5872	61.1957	58.5333	56.5685	54.3774	53.1320	54.5130	56.0268	58.3794	61.0989	63.2986	(42a)	
Hot water usage for baths													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42b)	
Hot water usage for other uses													
26.7406	25.7682	24.7958	23.8234	22.8511	21.8787	21.8787	22.8511	23.8234	24.7958	25.7682	26.7406	(42c)	
Average daily hot water use (litres/day)												82.8933 (43)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
90.2827	88.3554	85.9915	82.3567	79.4196	76.2561	75.0107	77.3640	79.8502	83.1752	86.8671	90.0392	(44)	
Energy conte	142.9857	125.8169	132.1657	112.7423	106.9140	93.7658	90.7189	95.7928	98.4633	112.8679	123.7581	140.9797	(45)
Energy content (annual)										Total = Sum(45)m =		1376.9712	
Distribution loss (46)m = 0.15 x (45)m													
21.4479	18.8725	19.8249	16.9113	16.0371	14.0649	13.6078	14.3689	14.7695	16.9302	18.5637	21.1470	(46)	
Water storage loss:													
Store volume												173.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.9200	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												1.0368	(55)
Total storage loss													
32.1408	29.0304	32.1408	31.1040	32.1408	31.1040	32.1408	32.1408	31.1040	32.1408	31.1040	32.1408	(56)	
If cylinder contains dedicated solar storage													
32.1408	29.0304	32.1408	31.1040	32.1408	31.1040	32.1408	32.1408	31.1040	32.1408	31.1040	32.1408	(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													
175.1265	154.8473	164.3065	143.8463	139.0548	124.8698	122.8597	127.9336	129.5673	145.0087	154.8621	173.1205	(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	175.1265	154.8473	164.3065	143.8463	139.0548	124.8698	122.8597	127.9336	129.5673	145.0087	154.8621	173.1205	(64)
										Total per year (kWh/year) = Sum(64)m =		1755.4032	(64)
Electric shower(s)													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
												0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =													
Heat gains from water heating, kWh/month													
47.5427	41.8341	43.9451	37.4868	35.5489	31.1771	30.1640	31.8511	32.7390	37.5286	41.1496	46.8757	(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	70.9536	70.9536	70.9536	70.9536	70.9536	70.9536	70.9536	70.9536	70.9536	70.9536	70.9536	70.9536 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.7948	12.2525	9.9644	7.5437	5.6390	4.7607	5.1441	6.6865	8.9745	11.3952	13.2999	14.1782 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	147.0598	148.5859	144.7403	136.5537	126.2195	116.5068	110.0181	108.4921	112.3376	120.5243	130.8585	140.5712 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	43.2779	43.2779	43.2779	43.2779	43.2779	43.2779	43.2779	43.2779	43.2779	43.2779	43.2779	43.2779 (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)	-47.3024	-47.3024	-47.3024	-47.3024	-47.3024	-47.3024	-47.3024	-47.3024	-47.3024	-47.3024	-47.3024	-47.3024 (71)
Water heating gains (Table 5)	63.9015	62.2531	59.0660	52.0650	47.7808	43.3016	40.5431	42.8106	45.4709	50.4416	57.1522	63.0050 (72)
Total internal gains	291.6853	290.0206	280.6998	263.0915	246.5684	231.4981	222.6344	224.9183	233.7122	249.2903	268.2397	284.6836 (73)

6. Solar gains

[Jan]	Area m ²		Solar flux Table 6a W/m ²		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W	
West	3.2000		23.8018		0.6600		0.7000		0.7700		24.3857 (80)	
Solar gains	24.3857	41.6668	67.9990	100.4212	119.6877	129.5174	122.1226	107.7006	84.2186	53.0371	29.9520	20.1691 (83)
Total gains	316.0710	331.6874	348.6988	363.5127	366.2561	361.0156	344.7569	332.6189	317.9307	302.3274	298.1917	304.8526 (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	97.3033	97.7705	97.7705	98.4372	98.2196	99.2597	99.2597	99.4530	99.2597	98.4372	98.6500	97.9973
alpha	7.4869	7.5180	7.5180	7.5625	7.5480	7.6173	7.6173	7.6302	7.6173	7.5625	7.5767	7.5332
util living area	0.9944	0.9904	0.9745	0.9135	0.7518	0.5028	0.3350	0.3570	0.6507	0.9235	0.9861	0.9955 (86)
MIT	20.4102	20.4988	20.6658	20.8608	20.9740	20.9989	21.0000	20.9999	20.9927	20.8693	20.6181	20.3937 (87)
Th 2	19.9430	19.9475	19.9475	19.9538	19.9518	19.9616	19.9616	19.9634	19.9616	19.9538	19.9558	19.9496 (88)
util rest of house	0.9915	0.9852	0.9608	0.8723	0.6686	0.4032	0.2296	0.2482	0.5437	0.8773	0.9775	0.9931 (89)
MIT 2	19.2960	19.4110	19.6162	19.8409	19.9382	19.9613	19.9616	19.9634	19.9592	19.8547	19.5681	19.2808 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	19.8166	19.9192	20.1066	20.3174	20.4221	20.4460	20.4467	20.4476	20.4421	20.3287	20.0586	19.8007 (92)
Temperature adjustment	0.0000											
adjusted MIT	19.8166	19.9192	20.1066	20.3174	20.4221	20.4460	20.4467	20.4476	20.4421	20.3287	20.0586	19.8007 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9910	0.9851	0.9633	0.8882	0.7074	0.4499	0.2788	0.2990	0.5942	0.8961	0.9785	0.9926 (94)
Useful gains	313.2306	326.7360	335.9012	322.8561	259.0878	162.4073	96.1311	99.4678	188.9130	270.9124	291.7868	302.6017 (95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000 (96)
Heat loss rate W	525.4401	505.2576	451.5090	367.6580	266.0639	162.6130	96.1353	99.4748	190.4737	311.5889	424.6631	521.1583 (97)
Space heating kWh	157.8839	119.9665	86.0122	32.2574	5.1903	0.0000	0.0000	0.0000	0.0000	30.2633	95.6709	162.6061 (98a)
Space heating requirement - total per year (kWh/year)	689.8506											
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	157.8839	119.9665	86.0122	32.2574	5.1903	0.0000	0.0000	0.0000	0.0000	30.2633	95.6709	162.6061 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	689.8506											
Space heating per m ²	(98c) / (4) =											

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)
Fraction of main heating from main system 2												0.0000 (203)
Fraction of total heating from main system 1												1.0000 (204)
Fraction of total heating from main system 2												0.0000 (205)
Efficiency of main space heating system 1 (in %)												100.0000 (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	157.8839	119.9665	86.0122	32.2574	5.1903	0.0000	0.0000	0.0000	0.0000	30.2633	95.6709	162.6061 (98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000 (210)
Space heating fuel (main heating system)	157.8839	119.9665	86.0122	32.2574	5.1903	0.0000	0.0000	0.0000	0.0000	30.2633	95.6709	162.6061 (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)
Space heating fuel used, main system 2	0.0000 (213)											
Water heating												

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Water heating requirement	175.1265	154.8473	164.3065	143.8463	139.0548	124.8698	122.8597	127.9336	129.5673	145.0087	154.8621	173.1205 (64)
Efficiency of water heater	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550 (216)
(217)m												302.9550 (217)
Fuel for water heating, kWh/month	57.8061	51.1123	54.2346	47.4811	45.8995	41.2173	40.5538	42.2286	42.7678	47.8648	51.1172	57.1440 (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	12.0745	9.6866	8.7218	6.3899	4.9358	4.0326	4.5026	5.8526	7.6020	9.9742	11.2658	12.4101 (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												689.8506 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												302.9550
Water heating fuel used												579.4270 (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)												97.4485 (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												1366.7261 (238)

10a. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	689.8506	28.4300	196.1245 (240)
Space heating - main system 2	0.0000	28.4300	0.0000 (241)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	579.4270	28.4300	164.7311 (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	97.4485	28.4300	27.7046 (250)
Additional standing charges			0.0000 (251)
Total energy cost			388.5602 (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	689.8506	0.1572	108.4544 (261)
Space heating - main system 2	0.0000	0.0000	0.0000 (262)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	579.4270	0.1410	81.6844 (264)
Space and water heating			190.1388 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	97.4485	0.1443	14.0648 (268)
Total CO2, kg/year			204.2036 (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	689.8506	1.5820	1091.3670 (275)
Space heating - main system 2	0.0000	0.0000	0.0000 (276)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	579.4270	1.5213	881.4684 (278)
Space and water heating			1972.8354 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	97.4485	1.5338	149.4698 (282)
Total Primary energy kWh/year			2122.3052 (286)

Summary for Input Data

Property Reference	1a Eaton Place GF		Issued on Date	04/09/2025
Assessment Reference	1a GF	Prop Type Ref		
Property	1a Eaton Place, RG1 7LP			

SAP Rating	80 C	DER	8.17	TER	18.80
Environmental	96 A	% DER < TER			56.54
CO ₂ Emissions (t/year)	0.2	DFEE	37.95	TFEE	47.51
Compliance Check	See BREL	% DFEE < TFEE			20.13
% DPER < TPER	15.32	DPER	84.69	TPER	100.01

Assessor Details	Mr. William Linley	Assessor ID	P977-0001
Client			

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

Orientation	West	
Property Tenture	ND	
Transaction Type	6	
Terrain Type	Urban	
1.0 Property Type	Flat, Semi-Detached	
Position of Flat	Ground-floor flat	
Which Floor	0	
2.0 Number of Storeys	1	
3.0 Date Built	2025	
4.0 Sheltered Sides	3	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	410.33	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	No	
Smart gas meter fitted	No	

7.0 Measurements	Ground floor:	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
		23.58 m	30.48 m ²	2.40 m

8.0 Living Area	14.24	m ²
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9.0 External Walls	Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area(m ²)	Nett Area (m ²)	Shelter Res	Shelter	Openings	Area Calculation Type
	Main	Cavity Wall	Cavity wall : plasterboard on dabs, AAC block, filled cavity, any outside structure	0.17	60.00	56.59	51.50	0.00	None	5.09	Calculate Wall Area

9.1 Party Walls	Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Area (m ²)	Shelter Res	Shelter
	Party Wall 1	Filled Cavity with Edge Sealing	Other	0.00	45.00	9.34		None

9.2 Internal Walls	Description	Construction	Kappa (kJ/m ² K)	Area (m ²)
	Internal Wall 1	Dense block, plasterboard on dabs	75.00	46.80

10.1 Party Ceilings	Description	Construction	Kappa (kJ/m ² K)	Area (m ²)
	Party Ceilings 1	Precast concrete plank floor (screed laid on rubber), carpeted	30.00	30.48

11.0 Heat Loss Floors	Description	Type	Storey Index	Construction	U-Value (W/m ² K)	Shelter Code	Shelter Factor	Kappa (kJ/m ² K)	Area (m ²)
	Heat Loss Floor 1	Ground Floor - Solid	Lowest occupied	Slab on ground, screed over insulation	0.11	None	0.00	110.00	30.48

12.0 Opening Types

Summary for Input Data

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			1.20
Windows	Manufacturer	Window	Double Low-E Soft 0.05			0.66		0.70	1.40

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
Front	Door	Main	West	1.89	
Front	Windows	Main	West	3.20	

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	3.36	0.02	0.02	Yes
E3 Sill	Independently assessed	2.46	0.02	0.02	Yes
E4 Jamb	Independently assessed	9.40	0.02	0.02	Yes
E5 Ground floor (normal)	Independently assessed	23.58	0.06	0.06	Yes
E7 Party floor between dwellings (in blocks of flats)	Independently assessed	23.58	0.04	0.04	No
E16 Corner (normal)	Independently assessed	7.20	0.04	0.04	No
E17 Corner (inverted – internal area greater than external area)	Independently assessed	2.40	-0.07	-0.07	No
E18 Party wall between dwellings	Independently assessed	4.80	0.04	0.04	Yes
P1 Party wall - Ground floor	Independently assessed	3.89	0.04	0.04	No
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	Table K1 - Default	3.89	0.00	0.00	No

Y-value

0.04

 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

2

Number of passive vents

0

Number of flueless gas fires

0

21.0 Fixed Cooling System

No

22.0 Pressure Testing

Yes

Designed AP₅₀

4.00

 m³/(h.m²) @ 50 Pa

Test Method

Blower Door

22.0 Lighting

No Fixed Lighting

No

Name	Efficacy	Power	Capacity	Count
Low energy Lighting	75.00	5.00	375.00	10

24.0 Main Heating 1

SAP table

Percentage of Heat

100.00

 %

Fuel Type

Electricity

SAP Code

691

In Winter

100.00

In Summer

302.95

Controls SAP Code

2603

PCDF Controls

0

Summary for Input Data

25.0 Main Heating 2

Database	Database	
Percentage of Heat	0.00	%
Database Ref. No.	105752	
Fuel Type	Electricity	
In Winter	0.00	
In Summer	302.95	
Model Name	EDL170-520RF	
Manufacturer	Auer	
Controls	2100	
PCDF Controls	0	

26.0 Heat Networks

None

27.0 Secondary Heating

None

28.0 Water Heating

Water Heating	Main Heating 2
SAP Code	914
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	0
Immersion Only Heating Hot Water	No

28.1 Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
1	Combi boiler or unvented hot water system	9.00		No	

28.3 Waste Water Heat Recovery System

29.0 Hot Water Cylinder

1.0 Hot Water Cylinder	Internal Store	
Insulation Type	Measured Loss	
Cylinder Volume	173.00	L
Loss	1.92	kWh/day
In Airing Cupboard	No	

34.0 Small-scale Hydro

None

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

Typical Cost	Typical savings per year	Ratings after improvement	
		SAP rating	Environmental Impact
		0	0
		0	0
		0	0

Energy Report



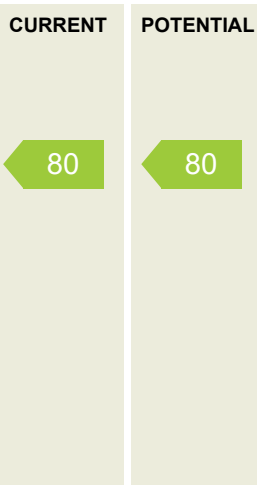
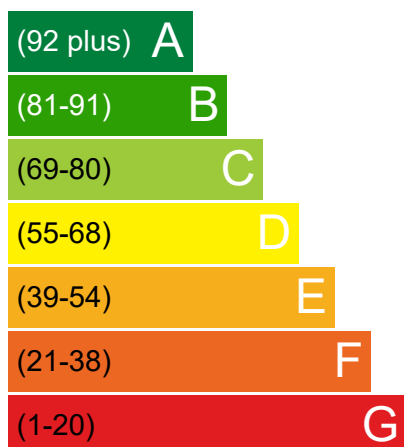
Dwelling Address	1a Eaton Place, RG1 7LP
Reference	1a Eaton Place GF-1a GF
Assessment Date	02/04/2025
Submission Date	
Property Type	Flat, Semi-Detached
Total Floor Area	30

This Energy Report has been generated using the UK's National Calculation Methodology for dwellings, Standard Assessment Procedure (SAP). This methodology is used to assess the energy efficiency of dwellings which is calculated based on a dwelling's heating, hot water, ventilation and lighting usage.

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

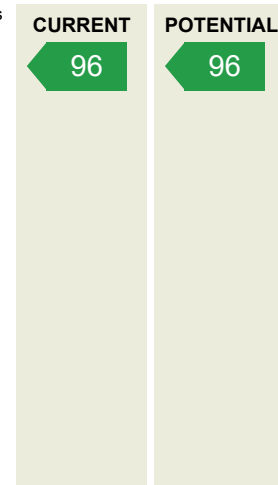
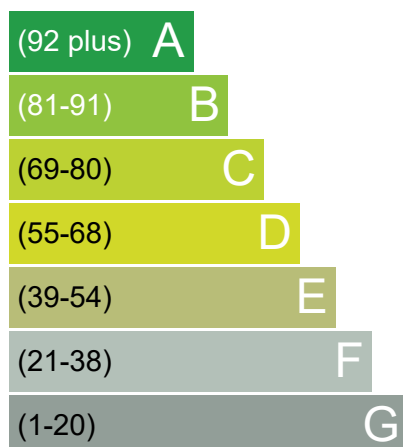
Energy Efficiency Rating

Most energy efficient - lower running costs

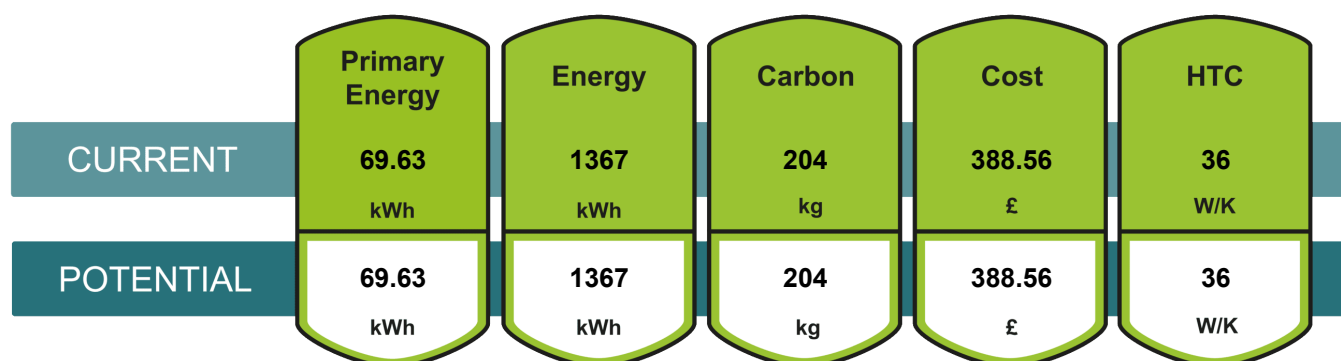


Carbon Dioxide (CO2) Emissions Rating

Very environmentally friendly - lower CO2 emissions



Additional ratings for your home



Breakdown of property's energy performance

Each feature is assessed as one of the following:

Very Poor	Poor	Average	Good	Very Good
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Feature	Description	Energy Performance
Walls	Average thermal transmittance 0.17 W/m ² K	Very Good
Floor	Average thermal transmittance 0.11 W/m ² K	Very Good
Windows	High performance glazing	Good
Main heating	Room heaters, electric	Very Poor
Main heating controls	Programmer and appliance thermostats	Good
Secondary heating	None	
Hot water	From main system	Very Good
Lighting	Good lighting efficiency	Good
Air tightness	Air permeability [AP50] = 4.0 m ³ /h.m ² (assumed)	Good

Recommendations

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

Recommended measures	Cumulative savings (per year)	Cumulative rating	Typical costs	Incremental savings (per year)	Cumulative CO2 rating
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The typical cost is based on average installation prices across the country so may not be representative of the actual costs in your area.

Estimated energy costs of the dwelling

Energy Report

The table below shows the estimated running costs of the space and water heating and lighting within the dwelling. It does not include the energy used from household appliances. The estimated annual costs after potential improvements indicates the total energy cost if all recommended measures named above were installed.

		Estimated annual costs	Estimated annual costs after potential improvements	Potential future savings
Lighting		£28	£28	
Heating		£196	£196	
Hot Water		£165	£165	
New Technologies e.g. Impact of PV		£0	£0	
TOTAL		£389	£389	

Estimated energy use and potential savings



Space Heating

690

kWh per year



Water Heating

579

kWh per year

About this document

Created by:

Company/Trading name:

Phone number:

Email address:

Disclaimer

This Energy Report should not under any circumstances be treated as a Condition Survey and cannot be used to indicate that any element of the dwelling (e.g. heating system) is working correctly.

This Energy Report must not be used in situations where an Energy Performance Certificate (EPC) is required.

This Energy Report is generated from a set of data inputs which may not reflect the actual dimensions, services or construction of the dwelling.

The calculation used to generate this report reflects the SAP Methodology current at the time of report generation.

Glossary terms for additional metrics

Primary Energy	The measure of the energy required for lighting, heating and hot water in a property. This includes the efficiency of the property's heating system, power station efficiency for electricity and the energy used to produce the fuel and deliver it to the property.
Energy Used	The estimated amount of fuel energy for lighting, heating and hot water for the property. The estimate is based on typical usage which is likely to be different to actual consumption.
Carbon (CO2)	The current emissions based on the energy estimates.
Cost	The estimated cost of energy. The cost of each unit of fuel is based on an industry standard which is likely to be different to those the occupier actually pays.
Heat Transfer Coefficient	Heat flow through the property envelope where internal and external temperatures are different.