

The following pages contain an example SAP calculation printout from Elmhurst's DesignSAP 10 software.

Key building characteristics from the printout that are required for B&NES and Cornwall Council's SAP Conversion Tool have been highlighted in yellow boxes, like the examples below:

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1. Overall dwelling characteristics
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	Area (m ²)		Storey height (m)		Volume (m ³)
Ground floor	46.6000 (1b)	x	2.6500 (2b)	=	123.4900 (1b) -
First floor	46.6000 (1c)	x	2.4000 (2c)	=	111.8400 (1c) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	93.2000				(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	235.3300 (5)

SAP 10 software is designed to provide compliance calculations only. It is not intended to represent real-world performance. Raw SAP 10 calculation results are not suitable for assessing performance against B&NES and Cornwall Council's net zero energy performance requirements for new buildings, as these are based on real-world performance.

The SAP Conversion Tool uses key building characteristics from a SAP 10 calculation to calculate more realistic energy performance, which can be used to assess performance against local net zero policy requirements. A comprehensive explanation of how this is achieved is available in the SAP Conversion Tool Methodology Report.

Full SAP Calculation Printout



Property Reference	SD - DPD Current - HP		Issued on Date	25/09/2023	
Assessment Reference	001	Prop Type Ref			
Property					
SAP Rating	103 A	DER	-0.21	TER	10.80
Environmental	100 A	% DER < TER	101.94		
CO ₂ Emissions (t/year)	-0.09	DFEE	36.16	TREE	36.50
Compliance Check	See BREL	% DFEE < TREE	0.92		
% DPER < TPER	102.64	DPER	-1.49	TPER	56.32
Assessor Details	Ms. Caitlin Brown		Assessor ID	AX87-0001	
Client					

CAUTION! Results should not be taken from this section

SAP 10 WORKSHEET FOR New Build (As Built) (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)
Ground floor	46.6000 (1b)	x 2.4000 (2b)	= 111.8400 (1b)
First floor	46.6000 (1c)	x 2.6500 (2c)	= 123.4900 (1c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	93.2000		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 235.3300 (5)
Dwelling volume			

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

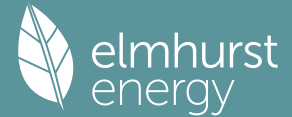
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	1.0000 (17)
Infiltration rate	0.0500 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.0463 (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	0.0590	0.0578	0.0567	0.0509	0.0497	0.0439	0.0439	0.0428	0.0463	0.0497	0.0520	0.0543 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												79.2000 (23c)
Effective ac	0.1630	0.1618	0.1607	0.1549	0.1537	0.1479	0.1479	0.1468	0.1502	0.1537	0.1560	0.1583 (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
Entrance Door			2.1200	1.0000	2.1200		(26)
Window FF 0.40 (Uw = 1.20)			4.6000	1.1450	5.2672		(27)

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Window FF 0.48 (Uw = 1.20)			5.2400	1.1450	6.0000				(27)
Window FF 0.52 (Uw = 1.20)			3.0900	1.1450	3.5382				(27)
Window FF 0.53 (Uw = 1.20)			0.7300	1.1450	0.8359				(27)
Window FF 0.70 (Uw = 1.20)			0.3000	1.1450	0.3435				(27)
Ground Floor			46.6000	0.1300	6.0580	75.0000	3495.0000		(28a)
Wall - NE	30.7600	9.0600	21.7000	0.2000	4.3400	70.0000	1519.0000		(29a)
Wall - SW	30.7600	7.0200	23.7400	0.2000	4.7480	70.0000	1661.8000		(29a)
Wall - NW	38.6300		38.6300	0.2000	7.7260	70.0000	2704.1000		(29a)
Roof	46.6000		46.6000	0.1100	5.1260	9.0000	419.4000		(30)
Total net area of external elements Aum(A, m2)			193.3500						(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		46.1027				(33)
Wall - SE			38.6300	0.0000	0.0000	45.0000	1738.3500		(32)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 11537.6500 (34)
 Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 123.7945 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E3 Sill	10.6200	0.0500	0.5310
E4 Jamb	27.1800	0.0500	1.3590
E2 Other lintels (including other steel lintels)	10.6200	0.0500	0.5310
E5 Ground floor (normal)	19.8300	0.1600	3.1728
E10 Eaves (insulation at ceiling level)	12.1800	0.0800	0.9744
E12 Gable (insulation at ceiling level)	7.6500	0.1200	0.9180
E16 Corner (normal)	10.1000	0.0500	0.5050
E18 Party wall between dwellings	10.1000	0.0400	0.4040
P1 Party wall - Ground floor	7.6500	0.1500	1.1475
P4 Party wall - Roof (insulation at ceiling level)	7.6500	0.1100	0.8415

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 10.3842 (36)

Point Thermal bridges (36a) = 0.0000
 Total fabric heat loss (33) + (36) + (36a) = 56.4869 (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	12.6560	12.5662	12.4764	12.0274	11.9376	11.4887	11.4887	11.3989	11.6682	11.9376	12.1172	12.2968 (38)
Average = Sum(39)m / 12 =	69.1429	69.0531	68.9633	68.5144	68.4246	67.9756	67.9756	67.8858	68.1552	68.4246	68.6041	68.7837 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.7419	0.7409	0.7399	0.7351	0.7342	0.7294	0.7294	0.7284	0.7313	0.7342	0.7361	0.7380 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6670 (42)

Hot water usage for mixer showers	68.9372	67.9012	66.3916	63.5031	61.3715	58.9944	57.6433	59.1415	60.7838	63.3361	66.2866	68.6731 (42a)
Hot water usage for baths	29.7685	29.3264	28.7038	27.5559	26.6963	25.7432	25.2284	25.8466	26.5198	27.5396	28.7112	29.6678 (42b)
Hot water usage for other uses	41.9431	40.4179	38.8927	37.3675	35.8423	34.3171	34.3171	35.8423	37.3675	38.8927	40.4179	41.9431 (42c)
Average daily hot water use (litres/day)												129.2880 (43)

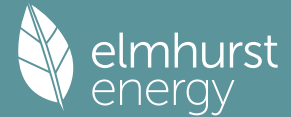
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	140.6488	137.6455	133.9881	128.4265	123.9102	119.0548	117.1888	120.8304	124.6711	129.7685	135.4157	140.2840 (44)
Energy content (annual)	222.7533	196.0054	205.9347	175.8095	166.8069	146.3917	141.7297	149.6133	153.7319	176.0946	192.9245	219.6509 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 2147.4464
	33.4130	29.4008	30.8902	26.3714	25.0210	21.9588	21.2595	22.4420	23.0598	26.4142	28.9387	32.9476 (46)

Water storage loss:
 Store volume 200.0000 (47)
 a) If manufacturer declared loss factor is known (kWh/day): 1.4000 (48)
 Temperature factor from Table 2b 0.5400 (49)
 Enter (49) or (54) in (55) 0.7560 (55)

Total storage loss	23.4360	21.1680	23.4360	22.6800	23.4360	22.6800	23.4360	23.4360	22.6800	23.4360	22.6800	23.4360 (56)
If cylinder contains dedicated solar storage	23.4360	21.1680	23.4360	22.6800	23.4360	22.6800	23.4360	23.4360	22.6800	23.4360	22.6800	23.4360 (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	269.4517	238.1846	252.6331	221.0015	213.5053	191.5837	188.4281	196.3117	198.9239	222.7930	238.1165	266.3493 (62)
WVHRS	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	269.4517	238.1846	252.6331	221.0015	213.5053	191.5837	188.4281	196.3117	198.9239	222.7930	238.1165	266.3493 (64)
12Total per year (kWh/year)												2697.2824 (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
 111.4242 98.9151 105.8320 94.6103 92.8220 84.8288 84.4838 87.1051 87.2695 95.9102 100.3010 110.3926 (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	133.3518	133.3518	133.3518	133.3518	133.3518	133.3518	133.3518	133.3518	133.3518	133.3518	133.3518	133.3518
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	142.4430	157.7047	142.4430	147.1911	142.4430	147.1911	142.4430	142.4430	147.1911	142.4430	147.1911	142.4430
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	244.8433	247.3840	240.9815	227.3513	210.1457	193.9748	183.1717	180.6310	187.0335	200.6636	217.8693	234.0402
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.3352	36.3352	36.3352	36.3352	36.3352	36.3352	36.3352	36.3352	36.3352	36.3352	36.3352	36.3352
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
Losses e.g. evaporation (negative values) (Table 5)	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815
Water heating gains (Table 5)	149.7637	147.1952	142.2473	131.4031	124.7608	117.8178	113.5535	117.0768	121.2076	128.9115	139.3069	148.3772
Total internal gains	600.0555	615.2894	588.6774	568.9511	540.3550	521.9893	502.1738	503.1563	518.4377	535.0237	567.3729	587.8659

6. Solar gains

[Jan]	Area		Solar flux		g		FF		Access		Gains	
	m2	W/m2	Table 6a	Specific data or Table 6b	Specific data or Table 6c	Specific data or Table 6c	Table 6d	Table 6d	Table 6d	Table 6d	W	
Northeast			4.6000	11.2829	0.6200	0.4000	0.7700	8.9200	(75)			
Northeast			1.3100	11.2829	0.6200	0.4800	0.7700	3.0483	(75)			
Southwest			3.9300	36.7938	0.6200	0.4800	0.7700	29.8218	(79)			
Southwest			3.0900	36.7938	0.6200	0.5200	0.7700	25.4016	(79)			
Northeast			0.7300	11.2829	0.6200	0.5300	0.7700	1.8756	(75)			
Northeast			0.3000	11.2829	0.6200	0.7000	0.7700	1.0180	(75)			
Solar gains	70.0854	124.3179	183.2096	248.9839	298.9435	305.6058	290.9644	252.3433	205.7750	140.9332	84.8452	59.3968
Total gains	670.1410	739.6074	771.8870	817.9350	839.2986	827.5951	793.1382	755.4996	724.2127	675.9569	652.2180	647.2627

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												
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	46.3519	46.4121	46.4726	46.7771	46.8385	47.1478	47.1478	47.2102	47.0236	46.8385	46.7159	46.5939
alpha	4.0901	4.0941	4.0982	4.1185	4.1226	4.1432	4.1432	4.1473	4.1349	4.1226	4.1144	4.1063
util living area	0.9516	0.9279	0.8923	0.8100	0.6809	0.5076	0.3729	0.4071	0.6065	0.8249	0.9227	0.9571
Living	19.8708	20.0703	20.3197	20.6355	20.8579	20.9673	20.9928	20.9896	20.9320	20.6627	20.2301	19.8275
Non living	19.5509	19.7478	19.9932	20.3008	20.5103	20.6098	20.6305	20.6286	20.5795	20.3300	19.9087	19.5097
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10
MIT	20.4224	20.0703	20.3197	20.6355	20.8579	20.9673	20.9928	20.9896	20.9320	20.6627	20.2301	19.9915
Th 2	20.6291	20.6295	20.6300	20.6324	20.6329	20.6353	20.6353	20.6358	20.6344	20.6329	20.6320	20.6310
util rest of house	0.9482	0.9230	0.8849	0.7976	0.6616	0.4817	0.3431	0.3763	0.5804	0.8110	0.9167	0.9540
MIT 2	20.0775	19.7478	19.9932	20.3008	20.5103	20.6098	20.6305	20.6286	20.5795	20.3300	19.9087	19.6665
Living area fraction									fLA = Living area / (4) =			0.3433
MIT	20.1959	19.8585	20.1053	20.4157	20.6297	20.7326	20.7549	20.7526	20.7005	20.4442	20.0190	19.7781
Temperature adjustment												0.0000
adjusted MIT	20.1959	19.8585	20.1053	20.4157	20.6297	20.7326	20.7549	20.7526	20.7005	20.4442	20.0190	19.7781

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9439	0.9115	0.8736	0.7899	0.6614	0.4887	0.3529	0.3862	0.5852	0.8034	0.9055	0.9459
Useful gains	632.5402	674.1757	674.3096	646.0627	555.1172	404.4269	279.8945	291.7827	423.8056	543.0427	590.6058	612.2515
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	1099.0911	1032.9335	938.2654	788.9919	611.0102	416.8651	282.4291	295.4778	449.8589	673.5859	886.3004	1071.5189
Space heating kWh	347.1139	241.0853	196.3831	102.9090	41.5844	0.0000	0.0000	0.0000	0.0000	97.1241	212.9001	341.6949
Space heating requirement - total per year (kWh/year)												1580.7950
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
Solar heating contribution - total per year (kWh/year)												0.0000
Space heating kWh	347.1139	241.0853	196.3831	102.9090	41.5844	0.0000	0.0000	0.0000	0.0000	97.1241	212.9001	341.6949
Space heating requirement after solar contribution - total per year (kWh/year)												1580.7950
Space heating per m2										(98c) / (4) =		16.9613

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

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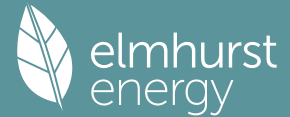


	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													311.0195 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement	347.1139	241.0853	196.3831	102.9090	41.5844	0.0000	0.0000	0.0000	0.0000	97.1241	212.9001	341.6949	(98)
Space heating efficiency (main heating system 1)	311.0195	311.0195	311.0195	311.0195	311.0195	0.0000	0.0000	0.0000	0.0000	311.0195	311.0195	311.0195	(210)
Space heating fuel (main heating system)	111.6052	77.5145	63.1417	33.0876	13.3704	0.0000	0.0000	0.0000	0.0000	31.2277	68.4523	109.8629	(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	269.4517	238.1846	252.6331	221.0015	213.5053	191.5837	188.4281	196.3117	198.9239	222.7930	238.1165	266.3493	(64)
Efficiency of water heater	188.5207	188.5207	188.5207	188.5207	188.5207	188.5207	188.5207	188.5207	188.5207	188.5207	188.5207	188.5207	(216)
Fuel for water heating, kWh/month	142.9295	126.3440	134.0081	117.2293	113.2530	101.6247	99.9509	104.1327	105.5183	118.1796	126.3078	141.2838	(219)
Space cooling fuel requirement	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	16.0935	14.5360	16.0935	15.5743	16.0935	15.5743	16.0935	16.0935	15.5743	16.0935	15.5743	16.0935	(231)
Lighting	35.0150	28.0903	25.2922	18.5302	14.3132	11.6940	13.0570	16.9720	22.0449	28.9241	32.6698	35.9881	(232)
Electricity generated by PVs (Appendix M) (negative quantity)	-73.3578	-123.8931	-212.5738	-279.5061	-332.5423	-319.4297	-314.8581	-281.8608	-226.0268	-157.5707	-87.1773	-61.0151	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)	-0.6991	-3.0627	-11.1534	-28.8454	-54.0320	-62.5046	-61.2709	-43.3494	-22.9847	-6.9087	-1.3654	-0.4659	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1													508.2623 (211)
Space heating fuel - main system 2													0.0000 (213)
Space heating fuel - secondary													0.0000 (215)
Efficiency of water heater													188.5207 (216)
Water heating fuel used													1430.7617 (219)
Space cooling fuel													0.0000 (221)
Electricity for pumps and fans: (BalancedWithHeatRecovery, DataSheet: in-use factor = 1.1000, SFP = 0.6600)													189.4877 (230a)
mechanical ventilation fans (SFP = 0.6600)													189.4877 (231)
Total electricity for the above, kWh/year													282.5909 (232)
Electricity for lighting (calculated in Appendix L)													
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation													-2766.4539 (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													-355.3513 (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 (high-rate cost)	406.6098	0.1636	66.5189 (261)
Space heating - main system 1 (low-rate cost)	101.6525	0.1373	13.9610 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating - high rate cost	1001.5332	0.1479	148.1638 (264)
Water heating - low rate cost	429.2285	0.1242	53.2930 (264)
Space and water heating			281.9367 (265)
Pumps, fans and electric keep-hot	189.4877	0.1432	26.2928 (267)
Energy for lighting	282.5909	0.1490	42.1116 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-2469.8117	0.1359	-335.6103
PV Unit electricity exported	-296.6422	0.1151	-34.1524
Total			-369.7627 (269)
Total CO2, kg/year			-19.4216 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			-0.2100 (273)

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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 (high-rate cost)	406.6098	1.2878	654.5653 (275)
Space heating - main system 1 (low-rate cost)	101.6525	1.4972	152.1928 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating - high rate cost	1001.5332	1.5530	1555.3689 (278)
Water heating - low rate cost	429.2285	1.4443	619.9477 (278)
Space and water heating			2982.0746 (279)
Pumps, fans and electric keep-hot	189.4877	1.5335	286.6864 (281)
Energy for lighting	282.5909	1.5547	439.3566 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-2469.8117	1.5068	-3721.4088
PV Unit electricity exported	-296.6422	0.4219	-125.1483
Total			-3846.5572 (283)
Total Primary energy kwh/year			-138.4394 (286)
Dwelling Primary energy Rate (DPER)			-1.4900 (287)

CAUTION! Results should not be taken from this section

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	46.6000 (1b)	x 2.4000 (2b)	= 111.8400 (1b) -
First floor	46.6000 (1c)	x 2.6500 (2c)	= 123.4900 (1c) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	93.2000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 235.3300 (5)

2. Ventilation rate

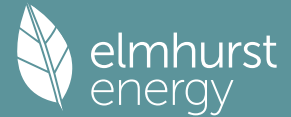
		m3 per hour
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1275 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3775 (18)
Number of sides sheltered		1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3492 (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	0.4452	0.4365	0.4277	0.3841	0.3754	0.3317	0.3317	0.3230	0.3492	0.3754	0.3928	0.4103 (22b)
Effective ac	0.5991	0.5952	0.5915	0.5738	0.5704	0.5550	0.5550	0.5522	0.5610	0.5704	0.5772	0.5842 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
TER Opaque door			2.1200	1.0000	2.1200		(26)
TER Opening Type (Uw = 1.20)			13.9600	1.1450	15.9847		(27)
Ground Floor			46.6000	0.1300	6.0580		(28a)

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Wall - NE	30.7600	9.0600	21.7000	0.1800	3.9060	(29a)
Wall - SW	30.7600	7.0200	23.7400	0.1800	4.2732	(29a)
Wall - NW	38.6300		38.6300	0.1800	6.9534	(29a)
Roof	46.6000		46.6000	0.1100	5.1260	(30)
Total net area of external elements Aum(A, m2)			193.3500			(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	44.4213		(33)
Wall - SE			38.6300	0.0000	0.0000	(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 123.7945 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E3 Sill	10.6200	0.0500	0.5310
E4 Jamb	27.1800	0.0500	1.3590
E2 Other lintels (including other steel lintels)	10.6200	0.0500	0.5310
E5 Ground floor (normal)	19.8300	0.1600	3.1728
E10 Eaves (insulation at ceiling level)	12.1800	0.0600	0.7308
E12 Gable (insulation at ceiling level)	7.6500	0.0600	0.4590
E16 Corner (normal)	10.1000	0.0900	0.9090
E18 Party wall between dwellings	10.1000	0.0600	0.6060
P1 Party wall - Ground floor	7.6500	0.0800	0.6120
P4 Party wall - Roof (insulation at ceiling level)	7.6500	0.1200	0.9180

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.8286 (36)

Point Thermal bridges

Total fabric heat loss (33) + (36) + (36a) = 54.2499 (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	46.5253	46.2264	45.9335	44.5577	44.3002	43.1019	43.1019	42.8800	43.5635	44.3002	44.8210	45.3654 (38)
Heat transfer coeff	100.7752	100.4764	100.1834	98.8076	98.5502	97.3519	97.3519	97.1300	97.8134	98.5502	99.0709	99.6153 (39)
Average = Sum(39)m / 12 =												98.8064

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0813	1.0781	1.0749	1.0602	1.0574	1.0445	1.0445	1.0422	1.0495	1.0574	1.0630	1.0688 (40)
HLP (average)												1.0602
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.6670 (42)
Hot water usage for mixer showers	68.9372	67.9012	66.3916	63.5031	61.3715	58.9944	57.6433	59.1415	60.7838	63.3361	66.2866	68.6731 (42a)	
Hot water usage for baths	29.7685	29.3264	28.7038	27.5559	26.6963	25.7432	25.2284	25.8466	26.5198	27.5396	28.7112	29.6678 (42b)	
Hot water usage for other uses	41.9431	40.4179	38.8927	37.3675	35.8423	34.3171	34.3171	35.8423	37.3675	38.8927	40.4179	41.9431 (42c)	
Average daily hot water use (litres/day)													129.2880 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	140.6488	137.6455	133.9881	128.4265	123.9102	119.0548	117.1888	120.8304	124.6711	129.7685	135.4157	140.2840 (44)	
Energy conte	222.7533	196.0054	205.9347	175.8095	166.8069	146.3917	141.7297	149.6133	153.7319	176.0946	192.9245	219.6509 (45)	
Energy content (annual)													Total = Sum(45)m = 2147.4464

Distribution loss (46)m = 0.15 x (45)m 32.9476 (46)

Water storage loss:
Store volume 200.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.6525 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.8924 (55)

Total storage loss 27.6637 (56)

If cylinder contains dedicated solar storage 27.6637 (57)

Primary loss 23.2624 (59)

Combi loss 0.0000 (61)

Total heat required for water heating calculated for each month 270.5770 (62)

WWHRS -30.9316 (63a)

PV diverter -0.0000 (63b)

Solar input 0.0000 (63c)

FGHRS 0.0000 (63d)

Output from w/h 239.6454 (64)

Total per year (kWh/year) = Sum(64)m = 2454.2336 (64)

12Total per year (kWh/year) 2454 (64)

Electric shower(s) 0.0000 (64a)

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

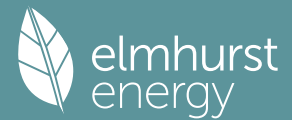
Heat gains from water heating, kWh/month 113.7748 (65)

114.8063 103.5740 (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	133.3518	133.3518	133.3518	133.3518	133.3518	133.3518	133.3518	133.3518	133.3518	133.3518	133.3518	133.3518 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												

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130.5857	144.5770	130.5857	134.9385	130.5857	134.9385	130.5857	130.5857	134.9385	130.5857	134.9385	130.5857	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
244.8433	247.3840	240.9815	227.3513	210.1457	193.9748	183.1717	180.6310	187.0335	200.6636	217.8693	234.0402	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
36.3352	36.3352	36.3352	36.3352	36.3352	36.3352	36.3352	36.3352	36.3352	36.3352	36.3352	36.3352	(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	(70)
Losses e.g. evaporation (negative values) (Table 5)												
-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	(71)
Water heating gains (Table 5)												
154.3096	151.7410	146.7932	135.9490	129.3067	122.3637	118.0994	121.6227	125.7535	133.4574	143.8528	152.9231	(72)
Total internal gains												
595.7441	609.7076	584.3659	564.2444	536.0436	514.2826	494.8623	495.8449	510.7310	530.7122	562.6662	583.5545	(73)

6. Solar gains

[Jan]	m2	Area	Solar flux	g	FF	Access	Gains					
	W/m2	Table 6a	Specific data	Specific data	Table 6c	factor	W					
			or Table 6b	or Table 6c		Table 6d						
Northeast		6.9400	11.2829	0.6300	0.7000	0.7700	23.9306 (75)					
Southwest		7.0200	36.7938	0.6300	0.7000	0.7700	78.9376 (79)					
Solar gains	102.8682	183.1714	271.7365	372.0839	449.0667	460.0277	437.6029	377.9981	306.1449	208.1361	124.6600	87.0971 (83)
Total gains	698.6123	792.8789	856.1024	936.3283	985.1102	974.3103	932.4652	873.8430	816.8759	738.8484	687.3261	670.6515 (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, ni1,m (see Table 9a)												
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	31.8025	31.8971	31.9903	32.4358	32.5205	32.9208	32.9208	32.9960	32.7655	32.5205	32.3496	32.1728
alpha	3.1202	3.1265	3.1327	3.1624	3.1680	3.1947	3.1947	3.1997	3.1844	3.1680	3.1566	3.1449
util living area	0.9613	0.9421	0.9117	0.8432	0.7320	0.5742	0.4379	0.4802	0.6841	0.8670	0.9409	0.9654 (86)
MIT	19.0230	19.2963	19.6835	20.2010	20.6151	20.8743	20.9603	20.9463	20.7708	20.2432	19.5641	18.9865 (87)
Th 2	20.0162	20.0188	20.0214	20.0335	20.0358	20.0464	20.0464	20.0483	20.0423	20.0358	20.0312	20.0264 (88)
util rest of house	0.9550	0.9328	0.8972	0.8170	0.6872	0.5057	0.3509	0.3918	0.6201	0.8392	0.9298	0.9598 (89)
MIT 2	17.7169	18.0616	18.5472	19.1876	19.6705	19.9512	20.0253	20.0179	19.8530	19.2527	18.4116	17.6773 (90)
Living area fraction									fLA = Living area / (4) =			0.3433 (91)
MIT	18.1654	18.4856	18.9373	19.5355	19.9948	20.2681	20.3463	20.3366	20.1681	19.5928	18.8073	18.1268 (92)
Temperature adjustment												0.0000
adjusted MIT	18.1654	18.4856	18.9373	19.5355	19.9948	20.2681	20.3463	20.3366	20.1681	19.5928	18.8073	18.1268 (93)

8. Space heating requirement

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9390	0.9142	0.8775	0.8016	0.6851	0.5224	0.3790	0.4195	0.6291	0.8241	0.9119	0.9448 (94)
Useful gains	655.9919	724.8448	751.1882	750.5875	674.9164	508.9411	353.4248	366.6001	513.9337	608.9102	626.7571	633.6043 (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	1397.2870	1365.0269	1246.0163	1050.8715	817.4579	551.8021	364.7122	382.3653	593.5465	886.2433	1159.8530	1387.3277 (97)
Space heating kWh	551.5236	430.2024	368.1521	216.2044	106.0509	0.0000	0.0000	0.0000	0.0000	206.3359	383.8290	560.7702 (98a)
Space heating requirement - total per year (kWh/year)												2823.0685
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	551.5236	430.2024	368.1521	216.2044	106.0509	0.0000	0.0000	0.0000	0.0000	206.3359	383.8290	560.7702 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2823.0685
Space heating per m2												(98c) / (4) = 30.2904 (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	551.5236	430.2024	368.1521	216.2044	106.0509	0.0000	0.0000	0.0000	0.0000	206.3359	383.8290	560.7702 (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)	597.5337	466.0914	398.8647	234.2410	114.8980	0.0000	0.0000	0.0000	0.0000	223.5492	415.8494	607.5517 (211)
Space heating efficiency (main heating system 2)												

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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	(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	242.1642	214.1308	227.6745	200.9254	195.2099	176.4018	174.5902	181.3285	183.0744	203.5126	215.5760	239.6454	(64)
Efficiency of water heater	(217)m	85.8459	85.5919	85.1312	84.2245	82.7524	79.8000	79.8000	79.8000	79.8000	84.0907	85.3385	79.8000 (216)
Fuel for water heating, kWh/month	282.0916	250.1763	267.4395	238.5594	235.8962	221.0549	218.7847	227.2286	229.4165	242.0156	252.6129	278.9837	(217)
Space cooling fuel requirement	(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685	(231)
Lighting	27.1331	21.7672	19.5989	14.3590	11.0913	9.0617	10.1179	13.1516	17.0826	22.4133	25.3158	27.8872	(232)
Electricity generated by PVs (Appendix M) (negative quantity)	(233a)m	-42.9407	-60.1977	-86.0351	-96.1474	-103.1600	-96.0746	-94.8601	-89.7939	-80.7910	-68.5387	-47.0772	-37.1626 (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	(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	(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	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)	(233b)m	-25.2908	-53.0890	-105.3227	-157.9172	-208.5635	-209.4971	-207.0561	-175.4431	-128.7498	-75.8596	-33.7438	-20.0100 (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	(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	(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	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1													3058.5791 (211)
Space heating fuel - main system 2													0.0000 (213)
Space heating fuel - secondary													0.0000 (215)
Efficiency of water heater													79.8000
Water heating fuel used													2944.2600 (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)													218.9798 (232)
Energy saving/generation technologies (Appendices M, N and Q)													
PV generation													-2303.3218 (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													4004.4972 (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	3058.5791	0.2100	642.3016 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2944.2600	0.2100	618.2946 (264)
Space and water heating			1260.5962 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	218.9798	0.1443	31.6056 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-902.7790	0.1347	-121.6198
PV Unit electricity exported	-1400.5427	0.1259	-176.3892
Total			-298.0091 (269)
Total CO2, kg/year			1006.1220 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.8000 (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	3058.5791	1.1300	3456.1944 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2944.2600	1.1300	3327.0138 (278)
Space and water heating			6783.2082 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	218.9798	1.5338	335.8785 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-902.7790	1.4979	-1352.2720
PV Unit electricity exported	-1400.5427	0.4623	-647.4725
Total			-1999.7444 (283)
Total Primary energy kWh/year			5249.4431 (286)

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Target Primary Energy Rate (TPER)

56.3200 (287)

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

CAUTION! Results should not be taken from this section

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	46.6000 (1b)	x 2.4000 (2b)	= 111.8400 (1b)
First floor	46.6000 (1c)	x 2.6500 (2c)	= 123.4900 (1c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	93.2000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 235.3300 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c)	30.0000 / (5) = 0.1275 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	1.0000 (17)
Infiltration rate	0.1775 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1642 (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	0.2093	0.2052	0.2011	0.1806	0.1765	0.1560	0.1560	0.1519	0.1642	0.1765	0.1847	0.1929 (22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000 (23c)
Effective ac	0.5219	0.5211	0.5202	0.5163	0.5156	0.5122	0.5122	0.5115	0.5135	0.5156	0.5171	0.5186 (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
Entrance Door			2.1200	1.0000	2.1200		(26)
Window FF 0.40 (Uw = 1.20)			4.6000	1.1450	5.2672		(27)
Window FF 0.48 (Uw = 1.20)			5.2400	1.1450	6.0000		(27)
Window FF 0.52 (Uw = 1.20)			3.0900	1.1450	3.5382		(27)
Window FF 0.53 (Uw = 1.20)			0.7300	1.1450	0.8359		(27)
Window FF 0.70 (Uw = 1.20)			0.3000	1.1450	0.3435		(27)
Ground Floor			46.6000	0.1300	6.0580	75.0000	3495.0000 (28a)
Wall - NE	30.7600	9.0600	21.7000	0.2000	4.3400	70.0000	1519.0000 (29a)
Wall - SW	30.7600	7.0200	23.7400	0.2000	4.7480	70.0000	1661.8000 (29a)
Wall - NW	38.6300		38.6300	0.2000	7.7260	70.0000	2704.1000 (29a)
Roof	46.6000		46.6000	0.1100	5.1260	9.0000	419.4000 (30)
Total net area of external elements Aum(A, m ²)			193.3500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	46.1027		(33)
Wall - SE			38.6300	0.0000	0.0000	45.0000	1738.3500 (32)
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =			11537.6500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							123.7945 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value		Total
E3 Sill				10.6200	0.0500		0.5310
E4 Jamb				27.1800	0.0500		1.3590
E2 Other lintels (including other steel lintels)				10.6200	0.0500		0.5310

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E5 Ground floor (normal)		19.8300	0.1600	3.1728	
E10 Eaves (insulation at ceiling level)		12.1800	0.0800	0.9744	
E12 Gable (insulation at ceiling level)		7.6500	0.1200	0.9180	
E16 Corner (normal)		10.1000	0.0500	0.5050	
E18 Party wall between dwellings		10.1000	0.0400	0.4040	
P1 Party wall - Ground floor		7.6500	0.1500	1.1475	
P4 Party wall - Roof (insulation at ceiling level)		7.6500	0.1100	0.8415	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)					10.3842 (36)
Point Thermal bridges					0.0000 (36a) =
Total fabric heat loss					56.4869 (37) (33) + (36) + (36a) =

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	40.5307	40.4646	40.3999	40.0957	40.0388	39.7739	39.7739	39.7249	39.8760	40.0388	40.1539	40.2743 (38)
Heat transfer coeff	97.0176	96.9516	96.8868	96.5827	96.5258	96.2609	96.2609	96.2118	96.3629	96.5258	96.6409	96.7612 (39)
Average = Sum(39)m / 12 =												96.5824

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0410	1.0403	1.0396	1.0363	1.0357	1.0328	1.0328	1.0323	1.0339	1.0357	1.0369	1.0382 (40)
HLP (average)												1.0363
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

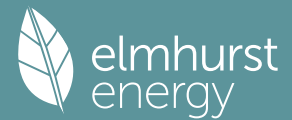
Assumed occupancy												2.6670 (42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42a)
Hot water usage for baths	29.7685	29.3264	28.7038	27.5559	26.6963	25.7432	25.2284	25.8466	26.5198	27.5396	28.7112	29.6678 (42b)
Hot water usage for other uses	41.9431	40.4179	38.8927	37.3675	35.8423	34.3171	34.3171	35.8423	37.3675	38.8927	40.4179	41.9431 (42c)
Average daily hot water use (litres/day)												65.7302 (43)
Daily hot water use	71.7116	69.7443	67.5965	64.9234	62.5386	60.0603	59.5455	61.6889	63.8873	66.4323	69.1291	71.6110 (44)
Energy content (annual)	113.5736	99.3149	103.8933	88.8769	84.1890	73.8512	72.0151	76.3838	78.7794	90.1480	98.4871	112.1255 (45)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
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	96.5376	84.4177	88.3093	75.5453	71.5607	62.7735	61.2129	64.9262	66.9625	76.6258	83.7140	95.3066 (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	96.5376	84.4177	88.3093	75.5453	71.5607	62.7735	61.2129	64.9262	66.9625	76.6258	83.7140	95.3066 (64)
												927.8923 (64)
												928 (64)
12Total per year (kWh/year)												
Electric shower(s)	55.2072	49.1901	53.7137	51.2583	52.2202	49.8130	51.4734	52.2202	51.2583	53.7137	52.7037	55.2072 (64a)
												627.9788 (64a)
Heat gains from water heating, kWh/month	37.9362	33.4019	35.5058	31.7009	30.9452	28.1466	28.1716	29.2866	29.5552	32.5849	34.1044	37.6285 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	133.3518	133.3518	133.3518	133.3518	133.3518	133.3518	133.3518	133.3518	133.3518	133.3518	133.3518	133.3518 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	142.4430	157.7047	142.4430	147.1911	142.4430	147.1911	142.4430	142.4430	147.1911	142.4430	147.1911	142.4430 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	244.8433	247.3840	240.9815	227.3513	210.1457	193.9748	183.1717	180.6310	187.0335	200.6636	217.8693	234.0402 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.3352	36.3352	36.3352	36.3352	36.3352	36.3352	36.3352	36.3352	36.3352	36.3352	36.3352	36.3352 (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)	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815 (71)
Water heating gains (Table 5)	50.9895	49.7053	47.7228	44.0290	41.5930	39.0925	37.8650	39.3637	41.0489	43.7969	47.3672	50.5759 (72)
Total internal gains	501.2814	517.7996	494.1528	481.5770	457.1873	443.2640	426.4852	425.4432	438.2790	449.9091	475.4332	490.0646 (73)

6. Solar gains

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[Jan]	m2		Area	Solar flux Table 6a	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
	W/m2							
Northeast			4.6000	11.2829	0.6200	0.4000	0.7700	8.9200 (75)
Northeast			1.3100	11.2829	0.6200	0.4800	0.7700	3.0483 (75)
Southwest			3.9300	36.7938	0.6200	0.4800	0.7700	29.8218 (79)
Southwest			3.0900	36.7938	0.6200	0.5200	0.7700	25.4016 (79)
Northeast			0.7300	11.2829	0.6200	0.5300	0.7700	1.8756 (75)
Northeast			0.3000	11.2829	0.6200	0.7000	0.7700	1.0180 (75)

Solar gains	70.0854	124.3179	183.2096	248.9839	298.9435	305.6058	290.9644	252.3433	205.7750	140.9332	84.8452	59.3968 (83)
Total gains	571.3668	642.1175	677.3624	730.5609	756.1308	748.8698	717.4497	677.7865	644.0540	590.8423	560.2783	549.4614 (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	33.0342	33.0567	33.0788	33.1830	33.2026	33.2939	33.2939	33.3109	33.2587	33.2026	33.1630	33.1218
alpha	3.2023	3.2038	3.2053	3.2122	3.2135	3.2196	3.2196	3.2207	3.2172	3.2135	3.2109	3.2081
util living area	0.9767	0.9650	0.9476	0.9038	0.8235	0.6840	0.5407	0.5842	0.7749	0.9161	0.9639	0.9794 (86)
MIT	18.8975	19.1363	19.4890	19.9923	20.4547	20.7939	20.9292	20.9074	20.6710	20.0828	19.4080	18.8456 (87)
Th 2	20.0493	20.0499	20.0505	20.0532	20.0537	20.0561	20.0561	20.0565	20.0551	20.0537	20.0527	20.0516 (88)
util rest of house	0.9727	0.9590	0.9381	0.8852	0.7866	0.6152	0.4419	0.4868	0.7171	0.8962	0.9567	0.9759 (89)
MIT 2	18.1250	18.3610	18.7090	19.1997	19.6342	19.9281	20.0250	20.0131	19.8330	19.2942	18.6341	18.0751 (90)
Living area fraction									fLA = Living area / (4) =			0.3433 (91)
MIT	18.3902	18.6272	18.9768	19.4719	19.9159	20.2254	20.3355	20.3202	20.1207	19.5650	18.8998	18.3397 (92)
Temperature adjustment												0.0000
adjusted MIT	18.3902	18.6272	18.9768	19.4719	19.9159	20.2254	20.3355	20.3202	20.1207	19.5650	18.8998	18.3397 (93)

8. Space heating requirement

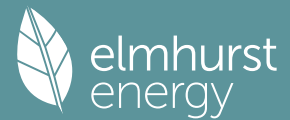
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9634	0.9474	0.9247	0.8716	0.7805	0.6285	0.4726	0.5157	0.7216	0.8836	0.9453	0.9672 (94)
Useful gains	550.4777	608.3696	626.3770	636.7507	590.1714	470.6743	339.0658	349.5106	464.7637	522.0759	529.6433	531.4600 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	1367.0000	1330.8768	1208.8392	1021.0577	793.0470	541.5025	359.5810	377.1687	580.1757	865.3520	1140.3461	1368.1714 (97)
Space heating kWh	607.4925	485.5248	433.3519	276.7011	150.9395	0.0000	0.0000	0.0000	0.0000	255.3975	439.7060	622.5133 (98a)
Space heating requirement - total per year (kWh/year)												3271.6265
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	607.4925	485.5248	433.3519	276.7011	150.9395	0.0000	0.0000	0.0000	0.0000	255.3975	439.7060	622.5133 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3271.6265
Space heating per m2										(98c) / (4) =		35.1033 (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	904.8521	712.3304	731.2097	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7168	0.7927	0.7616	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	648.5890	564.6310	556.9006	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	805.2820	771.8208	728.4237	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	112.8190	154.1492	127.6132	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	28.2047	38.5373	31.9033	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												98.6453 (107)
Energy for space heating												35.1033 (99)
Energy for space cooling												1.0584 (108)
Total												36.1617 (109)
Fabric Energy Efficiency (DFEE)												36.2 (109)

Full SAP Calculation Printout



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

CAUTION! Results should not be taken from this section

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	46.6000 (1b)	x 2.4000 (2b)	= 111.8400 (1b)
First floor	46.6000 (1c)	x 2.6500 (2c)	= 123.4900 (1c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	93.2000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 235.3300 (5)

2. Ventilation rate

	m ³ per hour											
Number of open chimneys	0 * 80 =	0.0000 (6a)										
Number of open flues	0 * 20 =	0.0000 (6b)										
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)										
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)										
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)										
Number of blocked chimneys	0 * 20 =	0.0000 (6f)										
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)										
Number of passive vents	0 * 10 =	0.0000 (7b)										
Number of flueless gas fires	0 * 40 =	0.0000 (7c)										
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	Air changes per hour	30.0000 / (5) = 0.1275 (8)										
Pressure test	Yes											
Pressure Test Method	Blower Door											
Measured/design AP50		5.0000 (17)										
Infiltration rate		0.3775 (18)										
Number of sides sheltered		1 (19)										
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.9250 (20)										
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3492 (21)										
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	0.4452	0.4365	0.4277	0.3841	0.3754	0.3317	0.3317	0.3230	0.3492	0.3754	0.3928	0.4103 (22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000 (23c)
Effective ac	0.5991	0.5952	0.5915	0.5738	0.5704	0.5550	0.5550	0.5522	0.5610	0.5704	0.5772	0.5842 (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
TER Opaque door			2.1200	1.0000	2.1200		(26)
TER Opening Type (Uw = 1.20)			13.9600	1.1450	15.9847		(27)
Ground Floor			46.6000	0.1300	6.0580		(28a)
Wall - NE	30.7600	9.0600	21.7000	0.1800	3.9060		(29a)
Wall - SW	30.7600	7.0200	23.7400	0.1800	4.2732		(29a)
Wall - NW	38.6300		38.6300	0.1800	6.9534		(29a)
Roof	46.6000		46.6000	0.1100	5.1260		(30)
Total net area of external elements Aum(A, m ²)			193.3500				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 44.4213		(33)
Wall - SE			38.6300	0.0000	0.0000		(32)

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

123.7945 (35)

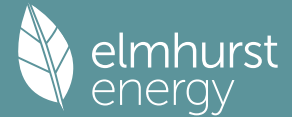
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E3 Sill	10.6200	0.0500	0.5310
E4 Jamb	27.1800	0.0500	1.3590
E2 Other lintels (including other steel lintels)	10.6200	0.0500	0.5310
E5 Ground floor (normal)	19.8300	0.1600	3.1728
E10 Eaves (insulation at ceiling level)	12.1800	0.0600	0.7308
E12 Gable (insulation at ceiling level)	7.6500	0.0600	0.4590
E16 Corner (normal)	10.1000	0.0900	0.9090
E18 Party wall between dwellings	10.1000	0.0600	0.6060
P1 Party wall - Ground floor	7.6500	0.0800	0.6120
P4 Party wall - Roof (insulation at ceiling level)	7.6500	0.1200	0.9180
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			9.8286 (36)
Point Thermal bridges			(36a) = 0.0000
Total fabric heat loss			(33) + (36) + (36a) = 54.2499 (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
	46.5253	46.2264	45.9335	44.5577	44.3002	43.1019	43.1019	42.8800	43.5635	44.3002	44.8210	45.3654 (38)

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Heat transfer coeff	100.7752	100.4764	100.1834	98.8076	98.5502	97.3519	97.3519	97.1300	97.8134	98.5502	99.0709	99.6153 (39)
Average = Sum(39)m / 12 =												98.8064
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0813	1.0781	1.0749	1.0602	1.0574	1.0445	1.0445	1.0422	1.0495	1.0574	1.0630	1.0688 (40)
HLP (average)												1.0602
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.6670 (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	29.7685	29.3264	28.7038	27.5559	26.6963	25.7432	25.2284	25.8466	26.5198	27.5396	28.7112	29.6678 (42b)
Hot water usage for other uses	41.9431	40.4179	38.8927	37.3675	35.8423	34.3171	34.3171	35.8423	37.3675	38.8927	40.4179	41.9431 (42c)
Average daily hot water use (litres/day)												65.7302 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	71.7116	69.7443	67.5965	64.9234	62.5386	60.0603	59.5455	61.6889	63.8873	66.4323	69.1291	71.6110 (44)
Energy content (annual)	113.5736	99.3149	103.8933	88.8769	84.1890	73.8512	72.0151	76.3838	78.7794	90.1480	98.4871	112.1255 (45)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
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	96.5376	84.4177	88.3093	75.5453	71.5607	62.7735	61.2129	64.9262	66.9625	76.6258	83.7140	95.3066 (62)
MWHRs	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	96.5376	84.4177	88.3093	75.5453	71.5607	62.7735	61.2129	64.9262	66.9625	76.6258	83.7140	95.3066 (64)
												927.8923 (64)
12Total per year (kWh/year)												928 (64)
Electric shower(s)	55.2072	49.1901	53.7137	51.2583	52.2202	49.8130	51.4734	52.2202	51.2583	53.7137	52.7037	55.2072 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												627.9788 (64a)
Heat gains from water heating, kWh/month	37.9362	33.4019	35.5058	31.7009	30.9452	28.1466	28.1716	29.2866	29.5552	32.5849	34.1044	37.6285 (65)

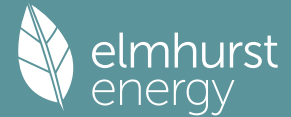
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	133.3518	133.3518	133.3518	133.3518	133.3518	133.3518	133.3518	133.3518	133.3518	133.3518	133.3518	133.3518 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	130.5857	144.5770	130.5857	134.9385	130.5857	134.9385	130.5857	130.5857	134.9385	130.5857	134.9385	130.5857 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	244.8433	247.3840	240.9815	227.3513	210.1457	193.9748	183.1717	180.6310	187.0335	200.6636	217.8693	234.0402 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.3352	36.3352	36.3352	36.3352	36.3352	36.3352	36.3352	36.3352	36.3352	36.3352	36.3352	36.3352 (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)	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815 (71)
Water heating gains (Table 5)	50.9895	49.7053	47.7228	44.0290	41.5930	39.0925	37.8650	39.3637	41.0489	43.7969	47.3672	50.5759 (72)
Total internal gains	489.4240	504.6718	482.2955	469.3244	445.3299	431.0114	414.6279	413.5859	426.0264	438.0517	463.1806	478.2073 (73)

6. Solar gains

[Jan]												
	m2	Area	Solar flux	g	FF	Access	Gains					
		W/m2	Table 6a	Specific data	Specific data	factor	W					
				or Table 6b	or Table 6c	Table 6d						
Northeast		6.9400	11.2829	0.6300	0.7000	0.7700	23.9306 (75)					
Southwest		7.0200	36.7938	0.6300	0.7000	0.7700	78.9376 (79)					
Solar gains	102.8682	183.1714	271.7365	372.0839	449.0667	460.0277	437.6029	377.9981	306.1449	208.1361	124.6600	87.0971 (83)
Total gains	592.2922	687.8432	754.0320	841.4084	894.3966	891.0391	852.2308	791.5840	732.1713	646.1879	587.8405	565.3043 (84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												
Utilisation factor for gains from living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	31.8025	31.8971	31.9903	32.4358	32.5205	32.9208	32.9208	32.9960	32.7655	32.5205	32.3496	32.1728
alpha	3.1202	3.1265	3.1327	3.1624	3.1680	3.1947	3.1947	3.1997	3.1844	3.1680	3.1566	3.1449
util living area	0.9747	0.9591	0.9339	0.8731	0.7693	0.6129	0.4732	0.5211	0.7292	0.8996	0.9598	0.9779 (86)
MIT	18.8388	19.1256	19.5341	20.0930	20.5501	20.8479	20.9505	20.9321	20.7216	20.1264	19.4020	18.8008 (87)
Th 2	20.0162	20.0188	20.0214	20.0335	20.0358	20.0464	20.0464	20.0483	20.0423	20.0358	20.0312	20.0264 (88)
util rest of house	0.9704	0.9522	0.9224	0.8502	0.7268	0.5433	0.3813	0.4281	0.6672	0.8766	0.9518	0.9741 (89)
MIT 2	18.0437	18.3280	18.7304	19.2765	19.6982	19.9552	20.0255	20.0177	19.8592	19.3201	18.6126	18.0133 (90)
Living area fraction									fLA = Living area / (4) =			0.3433 (91)
MIT	18.3167	18.6019	19.0063	19.5568	19.9907	20.2617	20.3431	20.3317	20.1553	19.5969	18.8837	18.2837 (92)
Temperature adjustment												0.0000
adjusted MIT	18.3167	18.6019	19.0063	19.5568	19.9907	20.2617	20.3431	20.3317	20.1553	19.5969	18.8837	18.2837 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9603	0.9394	0.9075	0.8371	0.7247	0.5599	0.4109	0.4570	0.6752	0.8641	0.9396	0.9649 (94)
Useful gains	568.7961	646.1435	684.3022	704.3555	648.1323	498.8892	350.1729	361.7536	494.3485	558.3695	552.3266	545.4895 (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	1412.5362	1376.7131	1252.9281	1052.9758	817.0490	551.1789	364.3951	381.8812	592.2883	886.6490	1167.4182	1402.9522 (97)
Space heating kWh	627.7426	490.9427	423.0577	251.0066	125.6740	0.0000	0.0000	0.0000	0.0000	244.2399	442.8659	637.9523 (98a)
Space heating requirement - total per year (kWh/year)												3243.4818
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	627.7426	490.9427	423.0577	251.0066	125.6740	0.0000	0.0000	0.0000	0.0000	244.2399	442.8659	637.9523 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3243.4818
Space heating per m2											(98c) / (4) =	34.8013 (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	915.1076	720.4039	738.1877	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7887	0.8522	0.8217	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	721.7852	613.8989	606.6036	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	984.7376	942.0954	873.8358	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	189.3257	244.1782	198.8208	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	47.3314	61.0445	49.7052	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												158.0812 (107)
Energy for space heating												34.8013 (99)
Energy for space cooling												1.6961 (108)
Total												36.4975 (109)
Fabric Energy Efficiency (TFEE)												36.5 (109)

CAUTION! Results should not be taken from this section

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	46.6000 (1b)	x 2.4000 (2b)	= 111.8400 (1b) -
First floor	46.6000 (1c)	x 2.6500 (2c)	= 123.4900 (1c) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	93.2000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	235.3300 (5)

Full SAP Calculation Printout



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

Air changes per hour

Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test			Yes
Pressure Test Method			Blower Door
Measured/design AP50			1.0000 (17)
Infiltration rate			0.0500 (18)
Number of sides sheltered			1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =		0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =		0.0463 (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	0.0590	0.0578	0.0567	0.0509	0.0497	0.0439	0.0439	0.0428	0.0463	0.0497	0.0520	0.0543 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												79.2000 (23c)
Effective ac	0.1630	0.1618	0.1607	0.1549	0.1537	0.1479	0.1479	0.1468	0.1502	0.1537	0.1560	0.1583 (25)

3. Heat losses and heat loss parameter

Element	m2	Gross	Openings	NetArea	U-value	A x U	K-value	A x K
			m2	m2	W/m2K	W/K	kJ/m2K	kJ/K
Entrance Door				2.1200	1.0000	2.1200		(26)
Window FF 0.40 (Uw = 1.20)				4.6000	1.1450	5.2672		(27)
Window FF 0.48 (Uw = 1.20)				5.2400	1.1450	6.0000		(27)
Window FF 0.52 (Uw = 1.20)				3.0900	1.1450	3.5382		(27)
Window FF 0.53 (Uw = 1.20)				0.7300	1.1450	0.8359		(27)
Window FF 0.70 (Uw = 1.20)				0.3000	1.1450	0.3435		(27)
Ground Floor				46.6000	0.1300	6.0580	75.0000	3495.0000 (28a)
Wall - NE		30.7600	9.0600	21.7000	0.2000	4.3400	70.0000	1519.0000 (29a)
Wall - SW		30.7600	7.0200	23.7400	0.2000	4.7480	70.0000	1661.8000 (29a)
Wall - NW		38.6300		38.6300	0.2000	7.7260	70.0000	2704.1000 (29a)
Roof		46.6000		46.6000	0.1100	5.1260	9.0000	419.4000 (30)
Total net area of external elements Aum(A, m2)				193.3500				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	46.1027		(33)
Wall - SE				38.6300	0.0000	0.0000	45.0000	1738.3500 (32)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	11537.6500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		123.7945 (35)

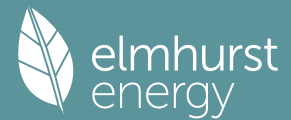
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E3 Sill	10.6200	0.0500	0.5310
E4 Jamb	27.1800	0.0500	1.3590
E2 Other lintels (including other steel lintels)	10.6200	0.0500	0.5310
E5 Ground floor (normal)	19.8300	0.1600	3.1728
E10 Eaves (insulation at ceiling level)	12.1800	0.0800	0.9744
E12 Gable (insulation at ceiling level)	7.6500	0.1200	0.9180
E16 Corner (normal)	10.1000	0.0500	0.5050
E18 Party wall between dwellings	10.1000	0.0400	0.4040
P1 Party wall - Ground floor	7.6500	0.1500	1.1475
P4 Party wall - Roof (insulation at ceiling level)	7.6500	0.1100	0.8415
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			10.3842 (36)
Point Thermal bridges			(36a) = 0.0000
Total fabric heat loss			(33) + (36) + (36a) = 56.4869 (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	12.6560	12.5662	12.4764	12.0274	11.9376	11.4887	11.4887	11.3989	11.6682	11.9376	12.1172	12.2968 (38)
Heat transfer coeff	69.1429	69.0531	68.9633	68.5144	68.4246	67.9756	67.9756	67.8858	68.1552	68.4246	68.6041	68.7837 (39)
Average = Sum(39)m / 12 =												68.4919
HLP	0.7419	0.7409	0.7399	0.7351	0.7342	0.7294	0.7294	0.7284	0.7313	0.7342	0.7361	0.7380 (40)
HLP (average)												0.7349
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.6670 (42)
Hot water usage for mixer showers	68.9372	67.9012	66.3916	63.5031	61.3715	58.9944	57.6433	59.1415	60.7838	63.3361	66.2866	68.6731 (42a)
Hot water usage for baths	29.7685	29.3264	28.7038	27.5559	26.6963	25.7432	25.2284	25.8466	26.5198	27.5396	28.7112	29.6678 (42b)
Hot water usage for other uses	41.9431	40.4179	38.8927	37.3675	35.8423	34.3171	34.3171	35.8423	37.3675	38.8927	40.4179	41.9431 (42c)
Average daily hot water use (litres/day)	33.4130	29.4008	30.8902	26.3714	25.0210	21.9588	21.2595	22.4420	23.0598	26.4142	28.9387	129.2880 (43)
Daily hot water use	140.6488	137.6455	133.9881	128.4265	123.9102	119.0548	117.1888	120.8304	124.6711	129.7685	135.4157	140.2840 (44)
Energy content (annual)	222.7533	196.0054	205.9347	175.8095	166.8069	146.3917	141.7297	149.6133	153.7319	176.0946	192.9245	219.6509 (45)
Distribution loss (46)m = 0.15 x (45)m	33.4130	29.4008	30.8902	26.3714	25.0210	21.9588	21.2595	22.4420	23.0598	26.4142	28.9387	2147.4464
Water storage loss:												
Store volume												200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.4000 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7560 (55)
Total storage loss	23.4360	21.1680	23.4360	22.6800	23.4360	22.6800	23.4360	23.4360	22.6800	23.4360	22.6800	23.4360 (56)
If cylinder contains dedicated solar storage	23.4360	21.1680	23.4360	22.6800	23.4360	22.6800	23.4360	23.4360	22.6800	23.4360	22.6800	23.4360 (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	269.4517	238.1846	252.6331	221.0015	213.5053	191.5837	188.4281	196.3117	198.9239	222.7930	238.1165	266.3493 (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	269.4517	238.1846	252.6331	221.0015	213.5053	191.5837	188.4281	196.3117	198.9239	222.7930	238.1165	266.3493 (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	111.4242	98.9151	105.8320	94.6103	92.8220	84.8288	84.4838	87.1051	87.2695	95.9102	100.3010	110.3926 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	160.0222	160.0222	160.0222	160.0222	160.0222	160.0222	160.0222	160.0222	160.0222	160.0222	160.0222	160.0222 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	40.0037	35.5309	28.8957	21.8759	16.3525	13.8055	14.9173	19.3900	26.0253	33.0451	38.5685	41.1155 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	365.4377	369.2298	359.6739	339.3303	313.6503	289.5147	273.3906	269.5985	279.1545	299.4980	325.1780	349.3137 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.6693	53.6693	53.6693	53.6693	53.6693	53.6693	53.6693	53.6693	53.6693	53.6693	53.6693	53.6693 (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)	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815 (71)
Water heating gains (Table 5)	149.7637	147.1952	142.2473	131.4031	124.7608	117.8178	113.5535	117.0768	121.2076	128.9115	139.3069	148.3772 (72)
Total internal gains	662.2151	658.9659	637.8269	599.6194	561.7736	528.1480	508.8714	513.0753	533.3973	568.4645	610.0634	645.8164 (73)

6. Solar gains

[Jan]	m2	Area	Solar flux	g	FF	Access factor	Gains					
	W/m2		Table 6a	Specific data or Table 6b	Specific data or Table 6c	Table 6d	W					
Northeast		4.6000	11.2829	0.6200	0.4000	0.7700	8.9200 (75)					
Northeast		1.3100	11.2829	0.6200	0.4800	0.7700	3.0483 (75)					
Southwest		3.9300	36.7938	0.6200	0.4800	0.7700	29.8218 (79)					
Southwest		3.0900	36.7938	0.6200	0.5200	0.7700	25.4016 (79)					
Northeast		0.7300	11.2829	0.6200	0.5300	0.7700	1.8756 (75)					
Northeast		0.3000	11.2829	0.6200	0.7000	0.7700	1.0180 (75)					
Solar gains	70.0854	124.3179	183.2096	248.9839	298.9435	305.6058	290.9644	252.3433	205.7750	140.9332	84.8452	59.3968 (83)
Total gains	732.3005	783.2838	821.0365	848.6033	860.7171	833.7538	799.8358	765.4186	739.1723	709.3978	694.9086	705.2132 (84)

7. Mean internal temperature (heating season)

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, n11,m (see Table 9a)													
tau	46.3519	46.4121	46.4726	46.7771	46.8385	47.1478	47.1478	47.2102	47.0236	46.8385	46.7159	46.5939	
alpha	4.0901	4.0941	4.0982	4.1185	4.1226	4.1432	4.1432	4.1473	4.1349	4.1226	4.1144	4.1063	
util living area													
0.9370		0.9153	0.8742	0.7951	0.6688	0.5043	0.3699	0.4021	0.5967	0.8060	0.9080	0.9442 (86)	
Living	19.9766	20.1374	20.3831	20.6622	20.8671	20.9681	20.9930	20.9901	20.9359	20.6938	20.2939	19.9290	
Non living	19.6550	19.8134	20.0543	20.3259	20.5185	20.6105	20.6306	20.6290	20.5828	20.3589	19.9707	19.6096	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.4765	20.1374	20.3831	20.6622	20.8671	20.9681	20.9930	20.9901	20.9359	20.6938	20.2939	20.0788 (87)	
Th 2	20.6291	20.6295	20.6300	20.6324	20.6329	20.6353	20.6353	20.6358	20.6344	20.6329	20.6320	20.6310 (88)	
util rest of house													
0.9328		0.9098	0.8660	0.7822	0.6494	0.4785	0.3403	0.3716	0.5707	0.7914	0.9012	0.9404 (89)	
MIT 2	20.1307	19.8134	20.0543	20.3259	20.5185	20.6105	20.6306	20.6290	20.5828	20.3589	19.9707	19.7525 (90)	
Living area fraction									fLA = Living area / (4) =			0.3433 (91)	
MIT	20.2495	19.9246	20.1672	20.4414	20.6382	20.7332	20.7550	20.7529	20.7040	20.4739	20.0817	19.8645 (92)	
Temperature adjustment												0.0000	
adjusted MIT	20.2495	19.9246	20.1672	20.4414	20.6382	20.7332	20.7550	20.7529	20.7040	20.4739	20.0817	19.8645 (93)	

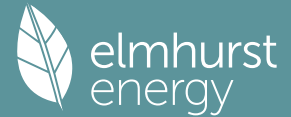
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9281	0.8981	0.8551	0.7752	0.6497	0.4855	0.3500	0.3815	0.5757	0.7847	0.8899	0.9315 (94)	
Useful gains	679.6448	703.5009	702.0336	657.8628	559.2189	404.7665	279.9815	291.9740	425.5420	556.6439	618.3804	656.9259 (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	1102.7916	1037.4983	942.5369	790.7482	611.5908	416.9108	282.4406	295.5032	450.0982	675.6172	890.5964	1077.4645 (97)	
Space heating kWh	314.8213	224.4463	178.9345	95.6775	38.9647	0.0000	0.0000	0.0000	0.0000	88.5162	195.9955	312.8807 (98a)	
Space heating requirement - total per year (kWh/year)												1450.2366	
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	314.8213	224.4463	178.9345	95.6775	38.9647	0.0000	0.0000	0.0000	0.0000	88.5162	195.9955	312.8807 (98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												1450.2366	
Space heating per m2									(98c) / (4) =			15.5605 (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 %)													311.0195 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement	314.8213	224.4463	178.9345	95.6775	38.9647	0.0000	0.0000	0.0000	0.0000	88.5162	195.9955	312.8807 (98)	
Space heating efficiency (main heating system 1)	311.0195	311.0195	311.0195	311.0195	311.0195	0.0000	0.0000	0.0000	0.0000	311.0195	311.0195	311.0195 (210)	
Space heating fuel (main heating system)	101.2224	72.1647	57.5316	30.7625	12.5281	0.0000	0.0000	0.0000	0.0000	28.4600	63.0171	100.5984 (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	269.4517	238.1846	252.6331	221.0015	213.5053	191.5837	188.4281	196.3117	198.9239	222.7930	238.1165	266.3493 (64)	
Efficiency of water heater	188.5207	188.5207	188.5207	188.5207	188.5207	188.5207	188.5207	188.5207	188.5207	188.5207	188.5207	188.5207 (216)	
Fuel for water heating, kWh/month	142.9295	126.3440	134.0081	117.2293	113.2530	101.6247	99.9509	104.1327	105.5183	118.1796	126.3078	141.2838 (219)	
Space cooling fuel requirement	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	16.0935	14.5360	16.0935	15.5743	16.0935	15.5743	16.0935	16.0935	15.5743	16.0935	15.5743	16.0935 (231)	
Lighting	35.0150	28.0903	25.2922	18.5302	14.3132	11.6940	13.0570	16.9720	22.0449	28.9241	32.6698	35.9881 (232)	
Electricity generated by PVs (Appendix M) (negative quantity)	-73.3425	-123.8537	-212.4297	-279.3314	-332.4171	-319.4297	-314.8581	-281.8608	-226.0268	-157.5180	-87.1588	-61.0058 (233a)	
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)	
Electricity generated by PVs (Appendix M) (negative quantity)	-0.7144	-3.1021	-11.2975	-29.0202	-54.1572	-62.5046	-61.2709	-43.3494	-22.9847	-6.9614	-1.3840	-0.4752 (233b)	
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													

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(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												466.2848	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												188.5207	
Water heating fuel used												1430.7617	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, DataSheet: in-use factor = 1.1000, SFP = 0.6600)													
mechanical ventilation fans (SFP = 0.6600)												189.4877	(230a)
Total electricity for the above, kWh/year												189.4877	(231)
Electricity for lighting (calculated in Appendix L)												282.5909	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-2766.4539	(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												-397.3288	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1 (high-rate cost)	373.0278	17.5600	73.1134 (240)
Space heating - main system 1 (low-rate cost)	93.2570	0.0940	8.7662 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (electric off-peak tariff)			
High-rate fraction			0.7000 (243)
Low-rate fraction			0.3000 (244)
High-rate cost	1001.5332	19.6000	196.3005 (245)
Low-rate cost	429.2285	9.4000	40.3475 (246)
Energy for instantaneous electric shower(s)	0.0000	18.5800	0.0000 (247a)
Pumps, fans and electric keep-hot (0.90*19.60 + 0.10*9.40)	189.4877	18.5800	31.5345 (249)
Energy for lighting (0.90*19.60 + 0.10*9.40)	282.5909	18.5800	52.5054 (250)
Additional standing charges			7.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-2469.2324	18.5800	-458.7834
PV Unit electricity exported	-297.2215	5.5900	-16.6147
Total			-475.3981 (252)
Total energy cost			-65.8305 (255)

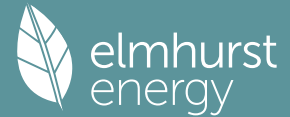
11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	-0.1715 (257)
SAP value		102.7797
SAP rating (Section 12)		103 (258)
SAP band		A

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1 (high-rate cost)	373.0278	0.1636	61.0139 (261)
Space heating - main system 1 (low-rate cost)	93.2570	0.1373	12.8058 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating - high rate cost	1001.5332	0.1479	148.1638 (264)
Water heating - low rate cost	429.2285	0.1242	53.2930 (264)
Space and water heating			275.2765 (265)
Pumps, fans and electric keep-hot	189.4877	0.1432	26.2928 (267)
Energy for lighting	282.5909	0.1490	42.1116 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-2469.2324	0.1359	-335.5237
PV Unit electricity exported	-297.2215	0.1152	-34.2432
Total			-369.7670 (269)
Total CO2, kg/year			-26.0861 (272)
CO2 emissions per m2			-0.2800 (273)
EI value			100.2529
EI rating			100 (274)
EI band			A

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CAUTION! Results should only be taken from this section for the EPC Costs

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	46.6000 (1b)	x 2.4000 (2b)	= 111.8400 (1b) -
First floor	46.6000 (1c)	x 2.6500 (2c)	= 123.4900 (1c) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	93.2000		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 235.3300 (5)
Dwelling volume			

2. Ventilation rate

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

	Value	Reference
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		
Pressure Test Method		
Measured/design AP50		
Infiltration rate		
Number of sides sheltered		
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.0463 (21)

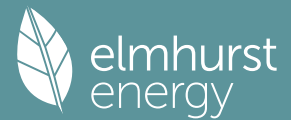
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	6.0000	5.6000	5.6000	5.0000	5.0000	4.4000	4.4000	4.3000	4.7000	5.4000	5.5000	5.9000 (22)
Wind factor	1.5000	1.4000	1.4000	1.2500	1.2500	1.1000	1.1000	1.0750	1.1750	1.3500	1.3750	1.4750 (22a)
Adj infilt rate	0.0694	0.0648	0.0648	0.0578	0.0578	0.0509	0.0509	0.0497	0.0543	0.0624	0.0636	0.0682 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												79.2000 (23c)
Effective ac	0.1734	0.1687	0.1687	0.1618	0.1618	0.1549	0.1549	0.1537	0.1583	0.1664	0.1676	0.1722 (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
Entrance Door			2.1200	1.0000	2.1200		(26)
Window FF 0.40 (Uw = 1.20)			4.6000	1.1450	5.2672		(27)
Window FF 0.48 (Uw = 1.20)			5.2400	1.1450	6.0000		(27)
Window FF 0.52 (Uw = 1.20)			3.0900	1.1450	3.5382		(27)
Window FF 0.53 (Uw = 1.20)			0.7300	1.1450	0.8359		(27)
Window FF 0.70 (Uw = 1.20)			0.3000	1.1450	0.3435		(27)
Ground Floor			46.6000	0.1300	6.0580	75.0000	3495.0000 (28a)
Wall - NE	30.7600	9.0600	21.7000	0.2000	4.3400	70.0000	1519.0000 (29a)
Wall - SW	30.7600	7.0200	23.7400	0.2000	4.7480	70.0000	1661.8000 (29a)
Wall - NW	38.6300		38.6300	0.2000	7.7260	70.0000	2704.1000 (29a)
Roof	46.6000		46.6000	0.1100	5.1260	9.0000	419.4000 (30)
Total net area of external elements Aum(A, m ²)			193.3500				(31)
Fabric heat loss, W/K = Sum (A x U)							(32)...
Wall - SE			38.6300	0.0000	0.0000	45.0000	1738.3500 (32)
Heat capacity Cm = Sum(A x k)							(28)...
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							(32) + (32a)...

List of Thermal Bridges	Length	Psi-value	Total
K1 Element	10.6200	0.0500	0.5310
E3 Sill	27.1800	0.0500	1.3590
E4 Jamb	10.6200	0.0500	0.5310
E2 Other lintels (including other steel lintels)	19.8300	0.1600	3.1728
E5 Ground floor (normal)	12.1800	0.0800	0.9744
E10 Eaves (insulation at ceiling level)	7.6500	0.1200	0.9180
E12 Gable (insulation at ceiling level)			

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E16 Corner (normal)					10.1000	0.0500	0.5050					
E18 Party wall between dwellings					10.1000	0.0400	0.4040					
P1 Party wall - Ground floor					7.6500	0.1500	1.1475					
P4 Party wall - Roof (insulation at ceiling level)					7.6500	0.1100	0.8415					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)												10.3842 (36)
Point Thermal bridges												0.0000 (36a) =
Total fabric heat loss												56.4869 (37) (33) + (36) + (36a) =
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	13.4641	13.1049	13.1049	12.5662	12.5662	12.0274	12.0274	11.9376	12.2968	12.9254	13.0151	13.3743 (38)
Average = Sum(39)m / 12 =	69.9510	69.5919	69.5919	69.0531	69.0531	68.5144	68.5144	68.4246	68.7837	69.4123	69.5021	69.8613 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.7505	0.7467	0.7467	0.7409	0.7409	0.7351	0.7351	0.7342	0.7380	0.7448	0.7457	0.7496 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.6670 (42)
Hot water usage for mixer showers	68.9372	67.9012	66.3916	63.5031	61.3715	58.9944	57.6433	59.1415	60.7838	63.3361	66.2866	68.6731 (42a)	
Hot water usage for baths	29.7685	29.3264	28.7038	27.5559	26.6963	25.7432	25.2284	25.8466	26.5198	27.5396	28.7112	29.6678 (42b)	
Hot water usage for other uses	41.9431	40.4179	38.8927	37.3675	35.8423	34.3171	34.3171	35.8423	37.3675	38.8927	40.4179	41.9431 (42c)	
Average daily hot water use (litres/day)													129.2880 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	140.6488	137.6455	133.9881	128.4265	123.9102	119.0548	117.1888	120.8304	124.6711	129.7685	135.4157	140.2840 (44)	
Energy content (annual)	222.7533	196.0054	205.9347	175.8095	166.8069	146.3917	141.7297	149.6133	153.7319	176.0946	192.9245	219.6509 (45)	
Distribution loss (46)m = 0.15 x (45)m													Total = Sum(45)m = 2147.4464
Distribution loss	33.4130	29.4008	30.8902	26.3714	25.0210	21.9588	21.2595	22.4420	23.0598	26.4142	28.9387	32.9476 (46)	
Water storage loss:													200.0000 (47)
Store volume													1.4000 (48)
a) If manufacturer declared loss factor is known (kWh/day):													0.5400 (49)
Temperature factor from Table 2b													0.7560 (55)
Enter (49) or (54) in (55)													
Total storage loss	23.4360	21.1680	23.4360	22.6800	23.4360	22.6800	23.4360	23.4360	22.6800	23.4360	22.6800	23.4360 (56)	
If cylinder contains dedicated solar storage	23.4360	21.1680	23.4360	22.6800	23.4360	22.6800	23.4360	23.4360	22.6800	23.4360	22.6800	23.4360 (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	269.4517	238.1846	252.6331	221.0015	213.5053	191.5837	188.4281	196.3117	198.9239	222.7930	238.1165	266.3493 (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	269.4517	238.1846	252.6331	221.0015	213.5053	191.5837	188.4281	196.3117	198.9239	222.7930	238.1165	266.3493 (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	111.4242	98.9151	105.8320	94.6103	92.8220	84.8288	84.4838	87.1051	87.2695	95.9102	100.3010	110.3926 (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	160.0222	160.0222	160.0222	160.0222	160.0222	160.0222	160.0222	160.0222	160.0222	160.0222	160.0222	160.0222 (66)	
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	40.0037	35.5309	28.8957	21.8759	16.3525	13.8055	14.9173	19.3900	26.0253	33.0451	38.5685	41.1155 (67)	
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	365.4377	369.2298	359.6739	339.3303	313.6503	289.5147	273.3906	269.5985	279.1545	299.4980	325.1780	349.3137 (68)	
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.6693	53.6693	53.6693	53.6693	53.6693	53.6693	53.6693	53.6693	53.6693	53.6693	53.6693	53.6693 (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)	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815 (71)	
Water heating gains (Table 5)	149.7637	147.1952	142.2473	131.4031	124.7608	117.8178	113.5535	117.0768	121.2076	128.9115	139.3069	148.3772 (72)	
Total internal gains	662.2151	658.9659	637.8269	599.6194	561.7736	528.1480	508.8714	513.0753	533.3973	568.4645	610.0634	645.8164 (73)	

6. Solar gains

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[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
Northeast	4.6000	15.4538	0.6200	0.4000	0.7700	12.2174 (75)
Northeast	1.3100	15.4538	0.6200	0.4800	0.7700	4.1752 (75)
Southwest	3.9300	47.2368	0.6200	0.4800	0.7700	38.2859 (79)
Southwest	3.0900	47.2368	0.6200	0.5200	0.7700	32.6112 (79)
Northeast	0.7300	15.4538	0.6200	0.5300	0.7700	2.5690 (75)
Northeast	0.3000	15.4538	0.6200	0.7000	0.7700	1.3944 (75)

Solar gains	91.2531	137.1943	203.0543	281.5749	322.4881	352.6879	310.5422	286.7220	234.8551	158.2364	106.5252	74.3909 (83)
Total gains	753.4682	796.1602	840.8812	881.1943	884.2616	880.8359	819.4136	799.7973	768.2524	726.7009	716.5886	720.2072 (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	45.8164	46.0528	46.0528	46.4121	46.4121	46.7771	46.7771	46.8385	46.5939	46.1720	46.1123	45.8753
alpha	4.0544	4.0702	4.0702	4.0941	4.0941	4.1185	4.1185	4.1226	4.1063	4.0781	4.0742	4.0584
util living area	0.9078	0.8870	0.8446	0.7673	0.6490	0.4901	0.3957	0.3964	0.5466	0.7481	0.8587	0.9135 (86)
Living	20.2197	20.3243	20.5000	20.7122	20.8810	20.9700	20.9899	20.9901	20.9556	20.7928	20.5230	20.2113
Non living	19.8911	19.9945	20.1649	20.3704	20.5278	20.6091	20.6254	20.6260	20.5963	20.4471	20.1899	19.8838
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10
MIT	20.6008	20.3243	20.5000	20.7122	20.8810	20.9700	20.9899	20.9901	20.9556	20.7928	20.5230	20.3216 (87)
Th 2	20.6247	20.6267	20.6267	20.6295	20.6295	20.6324	20.6324	20.6329	20.6310	20.6276	20.6271	20.6252 (88)
util rest of house	0.9013	0.8794	0.8345	0.7532	0.6290	0.4649	0.3667	0.3668	0.5193	0.7294	0.8480	0.9073 (89)
MIT 2	20.2494	19.9945	20.1649	20.3704	20.5278	20.6091	20.6254	20.6260	20.5963	20.4471	20.1899	19.9875 (90)
Living area fraction										fLA = Living area / (4) =		
MIT	20.3701	20.1077	20.2799	20.4877	20.6490	20.7330	20.7505	20.7510	20.7197	20.5658	20.3043	20.1022 (92)
Temperature adjustment												0.0000
adjusted MIT	20.3701	20.1077	20.2799	20.4877	20.6490	20.7330	20.7505	20.7510	20.7197	20.5658	20.3043	20.1022 (93)

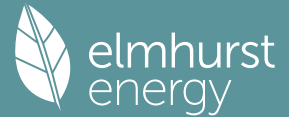
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8967	0.8680	0.8246	0.7476	0.6301	0.4718	0.3760	0.3764	0.5260	0.7261	0.8380	0.8977 (94)
Useful gains	675.6266	691.0455	693.3972	658.7621	557.1689	415.6137	308.1399	301.0115	404.0630	527.6925	600.5245	646.5339 (95)
Ext temp.	6.1000	6.4000	7.5000	9.3000	11.9000	14.5000	16.2000	16.3000	14.6000	11.8000	9.0000	6.4000 (96)
Heat loss rate W	998.2066	953.9458	889.3806	772.5462	604.1488	427.0513	311.7760	304.5595	420.9327	608.4547	785.6696	957.2541 (97)
Space heating kWh	239.9995	176.6690	145.8117	81.9246	34.9530	0.0000	0.0000	0.0000	0.0000	60.0870	133.3045	231.1758 (98a)
Space heating requirement - total per year (kWh/year)												1103.9252
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	239.9995	176.6690	145.8117	81.9246	34.9530	0.0000	0.0000	0.0000	0.0000	60.0870	133.3045	231.1758 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1103.9252
Space heating per m2										(98c) / (4) =		11.8447 (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 %)												310.8111 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement	239.9995	176.6690	145.8117	81.9246	34.9530	0.0000	0.0000	0.0000	0.0000	60.0870	133.3045	231.1758 (98)
Space heating efficiency (main heating system 1)	310.8111	310.8111	310.8111	310.8111	310.8111	0.0000	0.0000	0.0000	0.0000	310.8111	310.8111	310.8111 (210)
Space heating fuel (main heating system)	77.2172	56.8413	46.9133	26.3583	11.2457	0.0000	0.0000	0.0000	0.0000	19.3323	42.8892	74.3782 (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	269.4517	238.1846	252.6331	221.0015	213.5053	191.5837	188.4281	196.3117	198.9239	222.7930	238.1165	266.3493 (64)

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Efficiency of water heater (217)m	188.5352	188.5352	188.5352	188.5352	188.5352	188.5352	188.5352	188.5352	188.5352	188.5352	188.5352	188.5352	188.5352	188.5352 (216)
Fuel for water heating, kWh/month	142.9185	126.3343	133.9978	117.2203	113.2443	101.6170	99.9432	104.1247	105.5102	118.1705	126.2982	141.2730	141.2730	188.5352 (217)
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	16.0935	14.5360	16.0935	15.5743	16.0935	15.5743	16.0935	16.0935	15.5743	16.0935	15.5743	16.0935	16.0935	16.0935 (231)
Lighting	35.0150	28.0903	25.2922	18.5302	14.3132	11.6940	13.0570	16.9720	22.0449	28.9241	32.6698	35.9881	35.9881	(232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-97.5111	-139.1445	-236.6421	-311.2418	-352.3057	-324.3311	-320.5763	-312.2194	-255.5414	-178.7680	-111.4249	-78.1824	-78.1824	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity) (233b)m	-1.4958	-4.2939	-15.2825	-39.4933	-64.4702	-115.2916	-80.1337	-58.3045	-32.0288	-9.8414	-2.6508	-0.9148	-0.9148	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year														
Space heating fuel - main system 1													355.1756	(211)
Space heating fuel - main system 2													0.0000	(213)
Space heating fuel - secondary													0.0000	(215)
Efficiency of water heater													188.5352	
Water heating fuel used													1430.6520	(219)
Space cooling fuel													0.0000	(221)

Electricity for pumps and fans: (BalancedWithHeatRecovery, DataSheet: in-use factor = 1.1000, SFP = 0.6600)														
mechanical ventilation fans (SFP = 0.6600)														189.4877 (230a)
Total electricity for the above, kWh/year														189.4877 (231)
Electricity for lighting (calculated in Appendix L)														282.5909 (232)

Energy saving/generation technologies (Appendices M ,N and Q)														
PV generation														-3142.0900 (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														-884.1838 (238)

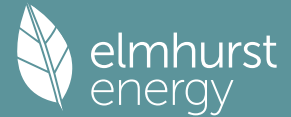
10a. Fuel costs - using BEDF prices (526)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1 (high-rate cost)	284.1405	22.8200	72.1717	(240)
Space heating - main system 1 (low-rate cost)	71.0351	0.1250	8.8794	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (electric off-peak tariff)			0.7000	(243)
High-rate fraction			0.3000	(244)
Low-rate fraction			254.3699	(245)
High-rate cost	1001.4564	25.4000	53.6494	(246)
Low-rate cost	429.1956	12.5000	0.0000	(247a)
Energy for instantaneous electric shower(s)	0.0000	24.1100	41.0411	(249)
Pumps, fans and electric keep-hot (0.90*25.40 + 0.10*12.50)	189.4877	24.1100	68.1327	(250)
Energy for lighting (0.90*25.40 + 0.10*12.50)	282.5909	24.1100	5.0000	(251)
Additional standing charges				
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-2717.8886	24.1100	-655.2829	
PV Unit electricity exported	-424.2014	5.5900	-23.7129	
Total			-678.9958	(252)
Total energy cost			-175.7515	(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 (high-rate cost)	284.1405	0.1635	46.4575	(261)
Space heating - main system 1 (low-rate cost)	71.0351	0.1373	9.7500	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating - high rate cost	1001.4564	0.1479	148.1524	(264)
Water heating - low rate cost	429.1956	0.1242	53.2890	(264)
Space and water heating			257.6489	(265)
Pumps, fans and electric keep-hot	189.4877	0.1432	26.2928	(267)
Energy for lighting	282.5909	0.1490	42.1116	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-2717.8886	0.1367	-371.5182	
PV Unit electricity exported	-424.2014	0.1147	-48.6676	
Total			-420.1858	(269)

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Total CO2, kg/year

-94.1324 (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 (high-rate cost)	284.1405	1.2876	457.3177 (275)
Space heating - main system 1 (low-rate cost)	71.0351	1.4969	106.3302 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating - high rate cost	1001.4564	1.5530	1555.2496 (278)
Water heating - low rate cost	429.1956	1.4443	619.9001 (278)
Space and water heating			2738.7976 (279)
Pumps, fans and electric keep-hot	189.4877	1.5335	286.6864 (281)
Energy for lighting	282.5909	1.5547	439.3566 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-2717.8886	1.5097	-4103.2132
PV Unit electricity exported	-424.2014	0.4204	-178.3405
Total			-4281.5537 (283)
Total Primary energy kWh/year			-816.7130 (286)

SAP 10 EPC IMPROVEMENTS

001

Current energy efficiency rating: A 103
Current environmental impact rating: A 100

N Solar water heating Cancelled by user
U Solar photovoltaic panels Already installed
V2 Wind turbine Not applicable

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

Recommended measures (none) Typical annual savings Energy Environmental efficiency impact
Total Savings £0 0.00 kg/m²
Potential energy efficiency rating: A 103
Potential environmental impact rating: A 100

Fuel prices for cost data on this page from database revision number 526 TEST (30 Aug 2023)
Recommendation texts revision number 6.1 (11 Jun 2019)

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

	Current £503	Potential £503	£0	Saving
Electricity				
Space heating	£127	£127	£0	
Water heating	£308	£308	£0	
Lighting	£68	£68	£0	
Generated (PV)	-£679	-£679	£0	
Total cost of fuels	-£176	-£176	£0	
Total cost of uses	-£176	-£176	£0	
Delivered energy	-9 kWh/m ²	-9 kWh/m ²	0 kWh/m ²	
Carbon dioxide emissions	-0.1 tonnes	-0.1 tonnes	0.0 tonnes	
CO2 emissions per m ²	-1 kg/m ²	-1 kg/m ²	0 kg/m ²	
Primary energy	-9 kWh/m ²	-9 kWh/m ²	0 kWh/m ²	

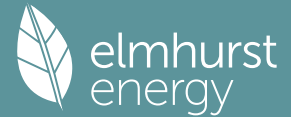
CAUTION! Results should not be taken from this section

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	46.6000 (1b)	x 2.4000 (2b)	= 111.8400 (1b) -

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First floor
 Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 93.2000 46.6000 (1c) x 2.6500 (2c) = 123.4900 (1c) -
 Dwelling volume (3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 235.3300 (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 0 * 10 = 0.0000 (7a)
 Number of passive vents 0 * 10 = 0.0000 (7b)
 Number of flueless gas fires 0 * 40 = 0.0000 (7c)

Air changes per hour
 Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) = 0.0000 / (5) = 0.0000 (8)
 Pressure test Yes
 Pressure Test Method Blower Door
 Measured/design AP50 1.0000 (17)
 Infiltration rate 0.0500 (18)
 Number of sides sheltered 1 (19)
 Shelter factor (20) = 1 - [0.075 x (19)] = 0.9250 (20)
 Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.0463 (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	0.0590	0.0578	0.0567	0.0509	0.0497	0.0439	0.0439	0.0428	0.0463	0.0497	0.0520	0.0543 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												79.2000 (23c)
Effective ac	0.1630	0.1618	0.1607	0.1549	0.1537	0.1479	0.1479	0.1468	0.1502	0.1537	0.1560	0.1583 (25)

3. Heat losses and heat loss parameter

Element	m2	Gross	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Entrance Door				2.1200	1.0000	2.1200		(26)
Window FF 0.40 (Uw = 1.20)				4.6000	1.1450	5.2672		(27)
Window FF 0.48 (Uw = 1.20)				5.2400	1.1450	6.0000		(27)
Window FF 0.52 (Uw = 1.20)				3.0900	1.1450	3.5382		(27)
Window FF 0.53 (Uw = 1.20)				0.7300	1.1450	0.8359		(27)
Window FF 0.70 (Uw = 1.20)				0.3000	1.1450	0.3435		(27)
Ground floor				46.6000	0.1300	6.0580	75.0000	3495.0000 (28a)
Wall - NE		30.7600	9.0600	21.7000	0.2000	4.3400	70.0000	1519.0000 (29a)
Wall - SW		30.7600	7.0200	23.7400	0.2000	4.7480	70.0000	1661.8000 (29a)
Wall - NW		38.6300		38.6300	0.2000	7.7260	70.0000	2704.1000 (29a)
Roof		46.6000		46.6000	0.1100	5.1260	9.0000	419.4000 (30)
Total net area of external elements Aum(A, m2)				193.3500				(31)
Fabric heat loss, W/K = Sum (A x U)						(26)...(30) + (32) = 46.1027		(33)
Wall - SE				38.6300	0.0000	0.0000	45.0000	1738.3500 (32)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 11537.6500 (34)
 Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 123.7945 (35)

List of Thermal Bridges

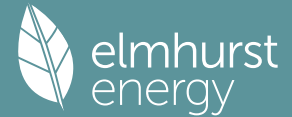
K1 Element	Length	Psi-value	Total
E3 Sill	10.6200	0.0500	0.5310
E4 Jamb	27.1800	0.0500	1.3590
E2 Other lintels (including other steel lintels)	10.6200	0.0500	0.5310
E5 Ground floor (normal)	19.8300	0.1600	3.1728
E10 Eaves (insulation at ceiling level)	12.1800	0.0800	0.9744
E12 Gable (insulation at ceiling level)	7.6500	0.1200	0.9180
E16 Corner (normal)	10.1000	0.0500	0.5050
E18 Party wall between dwellings	10.1000	0.0400	0.4040
P1 Party wall - Ground floor	7.6500	0.1500	1.1475
P4 Party wall - Roof (insulation at ceiling level)	7.6500	0.1100	0.8415

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 10.3842 (36)
 Point Thermal bridges (36a) = 0.0000
 Total fabric heat loss (33) + (36) + (36a) = 56.4869 (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	12.6560	12.5662	12.4764	12.0274	11.9376	11.4887	11.4887	11.3989	11.6682	11.9376	12.1172	12.2968 (38)
Heat transfer coeff	69.1429	69.0531	68.9633	68.5144	68.4246	67.9756	67.9756	67.8858	68.1552	68.4246	68.6041	68.7837 (39)
Average = Sum(39)m / 12 =												68.4919

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HLP	0.7419	0.7409	0.7399	0.7351	0.7342	0.7294	0.7294	0.7284	0.7313	0.7342	0.7361	0.7380 (40)
HLP (average)												0.7349
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.6670 (42)
Hot water usage for mixer showers												68.9372
Hot water usage for baths												29.7685
Hot water usage for other uses												41.9431
Average daily hot water use (litres/day)												129.2880 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy content (annual)	140.6488	137.6455	133.9881	128.4265	123.9102	119.0548	117.1888	120.8304	124.6711	129.7685	135.4157	140.2840 (44)
Distribution loss (46) _m = 0.15 x (45) _m	222.7533	196.0054	205.9347	175.8095	166.8069	146.3917	141.7297	149.6133	153.7319	176.0946	192.9245	219.6509 (45)
Water storage loss:												200.0000 (47)
Store volume												1.4000 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												0.7560 (55)
Enter (49) or (54) in (55)												0.7560 (55)
Total storage loss	33.4130	29.4008	30.8902	26.3714	25.0210	21.9588	21.2595	22.4420	23.0598	26.4142	28.9387	32.9476 (46)
If cylinder contains dedicated solar storage	23.4360	21.1680	23.4360	22.6800	23.4360	22.6800	23.4360	23.4360	22.6800	23.4360	22.6800	23.4360 (56)
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	269.4517	238.1846	252.6331	221.0015	213.5053	191.5837	188.4281	196.3117	198.9239	222.7930	238.1165	266.3493 (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	269.4517	238.1846	252.6331	221.0015	213.5053	191.5837	188.4281	196.3117	198.9239	222.7930	238.1165	266.3493 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Heat gains from water heating, kWh/month	111.4242	98.9151	105.8320	94.6103	92.8220	84.8288	84.4838	87.1051	87.2695	95.9102	100.3010	110.3926 (65)

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

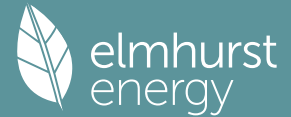
Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66) _m	160.0222	160.0222	160.0222	160.0222	160.0222	160.0222	160.0222	160.0222	160.0222	160.0222	160.0222	160.0222 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	40.0037	35.5309	28.8957	21.8759	16.3525	13.8055	14.9173	19.3900	26.0253	33.0451	38.5685	41.1155 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	365.4377	369.2298	359.6739	339.3303	313.6503	289.5147	273.3906	269.5985	279.1545	299.4980	325.1780	349.3137 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.6693	53.6693	53.6693	53.6693	53.6693	53.6693	53.6693	53.6693	53.6693	53.6693	53.6693	53.6693 (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)	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815 (71)
Water heating gains (Table 5)	149.7637	147.1952	142.2473	131.4031	124.7608	117.8178	113.5535	117.0768	121.2076	128.9115	139.3069	148.3772 (72)
Total internal gains	662.2151	658.9659	637.8269	599.6194	561.7736	528.1480	508.8714	513.0753	533.3973	568.4645	610.0634	645.8164 (73)

6. Solar gains

[Jan]	m2	Area	Solar flux Table 6a	Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
Northeast		4.6000	11.2829	0.6200	0.4000	0.7700	8.9200 (75)
Northeast		1.3100	11.2829	0.6200	0.4800	0.7700	3.0483 (75)
Southwest		3.9300	36.7938	0.6200	0.4800	0.7700	29.8218 (79)
Southwest		3.0900	36.7938	0.6200	0.5200	0.7700	25.4016 (79)
Northeast		0.7300	11.2829	0.6200	0.5300	0.7700	1.8756 (75)
Northeast		0.3000	11.2829	0.6200	0.7000	0.7700	1.0180 (75)

Solar gains	70.0854	124.3179	183.2096	248.9839	298.9435	305.6058	290.9644	252.3433	205.7750	140.9332	84.8452	59.3968 (83)
Total gains	732.3005	783.2838	821.0365	848.6033	860.7171	833.7538	799.8358	765.4186	739.1723	709.3978	694.9086	705.2132 (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	46.3519	46.4121	46.4726	46.7771	46.8385	47.1478	47.1478	47.2102	47.0236	46.8385	46.7159	46.5939
alpha	4.0901	4.0941	4.0982	4.1185	4.1226	4.1432	4.1432	4.1473	4.1349	4.1226	4.1144	4.1063
util living area	0.9370	0.9153	0.8742	0.7951	0.6688	0.5043	0.3699	0.4021	0.5967	0.8060	0.9080	0.9442 (86)
Living	19.9766	20.1374	20.3831	20.6622	20.8671	20.9681	20.9930	20.9901	20.9359	20.6938	20.2939	19.9290
Non living	19.6550	19.8134	20.0543	20.3259	20.5185	20.6105	20.6306	20.6290	20.5828	20.3589	19.9707	19.6096
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10
MIT	20.4765	20.1374	20.3831	20.6622	20.8671	20.9681	20.9930	20.9901	20.9359	20.6938	20.2939	20.0788 (87)
Th 2	20.6291	20.6295	20.6300	20.6324	20.6329	20.6353	20.6353	20.6358	20.6344	20.6329	20.6320	20.6310 (88)
util rest of house	0.9328	0.9098	0.8660	0.7822	0.6494	0.4785	0.3403	0.3716	0.5707	0.7914	0.9012	0.9404 (89)
MIT 2	20.1307	19.8134	20.0543	20.3259	20.5185	20.6105	20.6306	20.6290	20.5828	20.3589	19.9707	19.7525 (90)
Living area fraction										fLA = Living area / (4) =		0.3433 (91)
MIT	20.2495	19.9246	20.1672	20.4414	20.6382	20.7332	20.7550	20.7529	20.7040	20.4739	20.0817	19.8645 (92)
Temperature adjustment												0.0000
adjusted MIT	20.2495	19.9246	20.1672	20.4414	20.6382	20.7332	20.7550	20.7529	20.7040	20.4739	20.0817	19.8645 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9281	0.8981	0.8551	0.7752	0.6497	0.4855	0.3500	0.3815	0.5757	0.7847	0.8899	0.9315 (94)
Useful gains	679.6448	703.5009	702.0336	657.8628	559.2189	404.7665	279.9815	291.9740	425.5420	556.6439	618.3804	656.9259 (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	1102.7916	1037.4983	942.5369	790.7482	611.5908	416.9108	282.4406	295.5032	450.0982	675.6172	890.5964	1077.4645 (97)
Space heating kWh	314.8213	224.4463	178.9345	95.6775	38.9647	0.0000	0.0000	0.0000	0.0000	88.5162	195.9955	312.8807 (98a)
Space heating requirement - total per year (kWh/year)												1450.2366
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	314.8213	224.4463	178.9345	95.6775	38.9647	0.0000	0.0000	0.0000	0.0000	88.5162	195.9955	312.8807 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1450.2366
Space heating per m2										(98c) / (4) =		15.5605 (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 %) 311.0195 (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	314.8213	224.4463	178.9345	95.6775	38.9647	0.0000	0.0000	0.0000	0.0000	88.5162	195.9955	312.8807 (98)
Space heating efficiency (main heating system 1)	311.0195	311.0195	311.0195	311.0195	311.0195	0.0000	0.0000	0.0000	0.0000	311.0195	311.0195	311.0195 (210)
Space heating fuel (main heating system)	101.2224	72.1647	57.5316	30.7625	12.5281	0.0000	0.0000	0.0000	0.0000	28.4600	63.0171	100.5984 (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	269.4517	238.1846	252.6331	221.0015	213.5053	191.5837	188.4281	196.3117	198.9239	222.7930	238.1165	266.3493 (64)
Efficiency of water heater (217)m	188.5207	188.5207	188.5207	188.5207	188.5207	188.5207	188.5207	188.5207	188.5207	188.5207	188.5207	188.5207 (216)
Fuel for water heating, kWh/month	142.9295	126.3440	134.0081	117.2293	113.2530	101.6247	99.9509	104.1327	105.5183	118.1796	126.3078	141.2838 (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	16.0935	14.5360	16.0935	15.5743	16.0935	15.5743	16.0935	16.0935	15.5743	16.0935	15.5743	16.0935 (231)
Lighting	35.0150	28.0903	25.2922	18.5302	14.3132	11.6940	13.0570	16.9720	22.0449	28.9241	32.6698	35.9881 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-73.3425	-123.8537	-212.4297	-279.3314	-332.4171	-319.4297	-314.8581	-281.8608	-226.0268	-157.5180	-87.1588	-61.0058 (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)

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Electricity generated by PVs (Appendix M) (negative quantity) (233b)m	-0.7144	-3.1021	-11.2975	-29.0202	-54.1572	-62.5046	-61.2709	-43.3494	-22.9847	-6.9614	-1.3840	-0.4752	(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												466.2848	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												188.5207	
Water heating fuel used												1430.7617	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans: (Balanced with Heat Recovery, DataSheet: in-use factor = 1.1000, SFP = 0.6600) mechanical ventilation fans (SFP = 0.6600)												189.4877	(230a)
Total electricity for the above, kWh/year												189.4877	(231)
Electricity for lighting (calculated in Appendix L)												282.5909	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-2766.4539	(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												-397.3288	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1 (high-rate cost)	373.0278	17.5600	73.1134 (240)
Space heating - main system 1 (low-rate cost)	93.2570	0.0940	8.7662 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (electric off-peak tariff)			0.7000 (243)
High-rate fraction			0.3000 (244)
Low-rate fraction			0.0000 (245)
High-rate cost	1001.5332	19.6000	196.3005 (246)
Low-rate cost	429.2285	9.4000	40.3475 (246)
Energy for instantaneous electric shower(s)	0.0000	18.5800	0.0000 (247a)
Pumps, fans and electric keep-hot (0.90*19.60 + 0.10*9.40)	189.4877	18.5800	31.5345 (249)
Energy for lighting (0.90*19.60 + 0.10*9.40)	282.5909	18.5800	52.5054 (250)
Additional standing charges			7.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-2469.2324	18.5800	-458.7834
PV Unit electricity exported	-297.2215	5.5900	-16.6147
Total			-475.3981 (252)
Total energy cost			-65.8305 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	-0.1715 (257)
SAP value		102.7797
SAP rating (Section 12)		103 (258)
SAP band		A

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1 (high-rate cost)	373.0278	0.1636	61.0139 (261)
Space heating - main system 1 (low-rate cost)	93.2570	0.1373	12.8058 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating - high rate cost	1001.5332	0.1479	148.1638 (264)
Water heating - low rate cost	429.2285	0.1242	53.2930 (264)
Space and water heating			275.2765 (265)
Pumps, fans and electric keep-hot	189.4877	0.1432	26.2928 (267)
Energy for lighting	282.5909	0.1490	42.1116 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-2469.2324	0.1359	-335.5237
PV Unit electricity exported	-297.2215	0.1152	-34.2432
Total			-369.7670 (269)
Total CO2, kg/year			-26.0861 (272)
CO2 emissions per m2			-0.2800 (273)
EI value			100.2529
EI rating			100 (274)
EI band			A

CAUTION! Results should not be taken from this section

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	46.6000 (1b)	x 2.4000 (2b)	= 111.8400 (1b)
First floor	46.6000 (1c)	x 2.6500 (2c)	= 123.4900 (1c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	93.2000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 235.3300 (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	0 * 10 =											0.0000 (7a)
Number of passive vents	0 * 10 =											0.0000 (7b)
Number of flueless gas fires	0 * 40 =											0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =											0.0000 (8)
Pressure test												Yes
Pressure Test Method												Blower Door
Measured/design AP50												1.0000 (17)
Infiltration rate												0.0500 (18)
Number of sides sheltered												1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =											0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =											0.0463 (21)
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	6.0000	5.6000	5.6000	5.0000	5.0000	4.4000	4.4000	4.3000	4.7000	5.4000	5.5000	5.9000 (22)
Adj infilt rate	1.5000	1.4000	1.4000	1.2500	1.2500	1.1000	1.1000	1.0750	1.1750	1.3500	1.3750	1.4750 (22a)
Balanced mechanical ventilation with heat recovery	0.0694	0.0648	0.0648	0.0578	0.0578	0.0509	0.0509	0.0497	0.0543	0.0624	0.0636	0.0682 (22b)
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												79.2000 (23c)
Effective ac	0.1734	0.1687	0.1687	0.1618	0.1618	0.1549	0.1549	0.1537	0.1583	0.1664	0.1676	0.1722 (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
Entrance Door			2.1200	1.0000	2.1200		(26)
Window FF 0.40 (Uw = 1.20)			4.6000	1.1450	5.2672		(27)
Window FF 0.48 (Uw = 1.20)			5.2400	1.1450	6.0000		(27)
Window FF 0.52 (Uw = 1.20)			3.0900	1.1450	3.5382		(27)
Window FF 0.53 (Uw = 1.20)			0.7300	1.1450	0.8359		(27)
Window FF 0.70 (Uw = 1.20)			0.3000	1.1450	0.3435		(27)
Ground Floor			46.6000	0.1300	6.0580	75.0000	3495.0000 (28a)
Wall - NE	30.7600	9.0600	21.7000	0.2000	4.3400	70.0000	1519.0000 (29a)
Wall - SW	30.7600	7.0200	23.7400	0.2000	4.7480	70.0000	1661.8000 (29a)
Wall - NW	38.6300		38.6300	0.2000	7.7260	70.0000	2704.1000 (29a)
Roof	46.6000		46.6000	0.1100	5.1260	9.0000	419.4000 (30)
Total net area of external elements Aum(A, m ²)			193.3500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	46.1027		(33)
Wall - SE			38.6300	0.0000	0.0000	45.0000	1738.3500 (32)
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =			11537.6500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							123.7945 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E3 Sill				10.6200	0.0500	0.5310	

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E4 Jamb						27.1800	0.0500	1.3590
E2 Other lintels (including other steel lintels)						10.6200	0.0500	0.5310
E5 Ground floor (normal)						19.8300	0.1600	3.1728
E10 Eaves (insulation at ceiling level)						12.1800	0.0800	0.9744
E12 Gable (insulation at ceiling level)						7.6500	0.1200	0.9180
E16 Corner (normal)						10.1000	0.0500	0.5050
E18 Party wall between dwellings						10.1000	0.0400	0.4040
P1 Party wall - Ground floor						7.6500	0.1500	1.1475
P4 Party wall - Roof (insulation at ceiling level)						7.6500	0.1100	0.8415
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								10.3842 (36)
Point Thermal bridges								0.0000 (36a) =
Total fabric heat loss								56.4869 (33) + (36) + (36a) =

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	13.4641	13.1049	13.1049	12.5662	12.5662	12.0274	12.0274	11.9376	12.2968	12.9254	13.0151	13.3743 (38)
Heat transfer coeff												
69.9510		69.5919	69.5919	69.0531	69.0531	68.5144	68.5144	68.4246	68.7837	69.4123	69.5021	69.8613 (39)
Average = Sum(39)m / 12 =												69.1878

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.7505	0.7467	0.7467	0.7409	0.7409	0.7351	0.7351	0.7342	0.7380	0.7448	0.7457	0.7496 (40)
HLP (average)												0.7424
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6670 (42)

Hot water usage for mixer showers	68.9372	67.9012	66.3916	63.5031	61.3715	58.9944	57.6433	59.1415	60.7838	63.3361	66.2866	68.6731 (42a)
Hot water usage for baths	29.7685	29.3264	28.7038	27.5559	26.6963	25.7432	25.2284	25.8466	26.5198	27.5396	28.7112	29.6678 (42b)
Hot water usage for other uses	41.9431	40.4179	38.8927	37.3675	35.8423	34.3171	34.3171	35.8423	37.3675	38.8927	40.4179	41.9431 (42c)
Average daily hot water use (litres/day)												129.2880 (43)

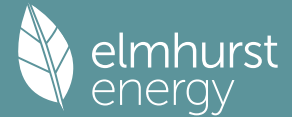
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	140.6488	137.6455	133.9881	128.4265	123.9102	119.0548	117.1888	120.8304	124.6711	129.7685	135.4157	140.2840 (44)
Energy content	222.7533	196.0054	205.9347	175.8095	166.8069	146.3917	141.7297	149.6133	153.7319	176.0946	192.9245	219.6509 (45)
Energy content (annual)												Total = Sum(45)m = 2147.4464
Distribution loss (46)m = 0.15 x (45)m	33.4130	29.4008	30.8902	26.3714	25.0210	21.9588	21.2595	22.4420	23.0598	26.4142	28.9387	32.9476 (46)
Water storage loss:												
Store volume												200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.4000 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7560 (55)
Total storage loss	23.4360	21.1680	23.4360	22.6800	23.4360	22.6800	23.4360	23.4360	22.6800	23.4360	22.6800	23.4360 (56)
If cylinder contains dedicated solar storage	23.4360	21.1680	23.4360	22.6800	23.4360	22.6800	23.4360	23.4360	22.6800	23.4360	22.6800	23.4360 (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	269.4517	238.1846	252.6331	221.0015	213.5053	191.5837	188.4281	196.3117	198.9239	222.7930	238.1165	266.3493 (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	269.4517	238.1846	252.6331	221.0015	213.5053	191.5837	188.4281	196.3117	198.9239	222.7930	238.1165	266.3493 (64)
Total per year (kWh/year) = Sum(64)m =												2697.2824 (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	111.4242	98.9151	105.8320	94.6103	92.8220	84.8288	84.4838	87.1051	87.2695	95.9102	100.3010	110.3926 (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	160.0222	160.0222	160.0222	160.0222	160.0222	160.0222	160.0222	160.0222	160.0222	160.0222	160.0222	160.0222 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	40.0037	35.5309	28.8957	21.8759	16.3525	13.8055	14.9173	19.3900	26.0253	33.0451	38.5685	41.1155 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	365.4377	369.2298	359.6739	339.3303	313.6503	289.5147	273.3906	269.5985	279.1545	299.4980	325.1780	349.3137 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.6693	53.6693	53.6693	53.6693	53.6693	53.6693	53.6693	53.6693	53.6693	53.6693	53.6693	53.6693 (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)	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815	-106.6815 (71)
Water heating gains (Table 5)	149.7637	147.1952	142.2473	131.4031	124.7608	117.8178	113.5535	117.0768	121.2076	128.9115	139.3069	148.3772 (72)
Total internal gains	662.2151	658.9659	637.8269	599.6194	561.7736	528.1480	508.8714	513.0753	533.3973	568.4645	610.0634	645.8164 (73)

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6. Solar gains

[Jan]	m2	Area	Solar flux Table 6a	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
		W/m2					
Northeast		4.6000	15.4538	0.6200	0.4000	0.7700	12.2174 (75)
Northeast		1.3100	15.4538	0.6200	0.4800	0.7700	4.1752 (75)
Southwest		3.9300	47.2368	0.6200	0.4800	0.7700	38.2859 (79)
Southwest		3.0900	47.2368	0.6200	0.5200	0.7700	32.6112 (79)
Northeast		0.7300	15.4538	0.6200	0.5300	0.7700	2.5690 (75)
Northeast		0.3000	15.4538	0.6200	0.7000	0.7700	1.3944 (75)

Solar gains	91.2531	137.1943	203.0543	281.5749	322.4881	352.6879	310.5422	286.7220	234.8551	158.2364	106.5252	74.3909 (83)
Total gains	753.4682	796.1602	840.8812	881.1943	884.2616	880.8359	819.4136	799.7973	768.2524	726.7009	716.5886	720.2072 (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	45.8164	46.0528	46.0528	46.4121	46.4121	46.7771	46.7771	46.8385	46.5939	46.1720	46.1123	45.8753
alpha	4.0544	4.0702	4.0702	4.0941	4.0941	4.1185	4.1185	4.1226	4.1063	4.0781	4.0742	4.0584
util living area	0.9078	0.8870	0.8446	0.7673	0.6490	0.4901	0.3957	0.3964	0.5466	0.7481	0.8587	0.9135 (86)
Living	20.2197	20.3243	20.5000	20.7122	20.8810	20.9700	20.9899	20.9901	20.9556	20.7928	20.5230	20.2113
Non living	19.8911	19.9945	20.1649	20.3704	20.5278	20.6091	20.6254	20.6260	20.5963	20.4471	20.1899	19.8838
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10
MIT	20.6008	20.3243	20.5000	20.7122	20.8810	20.9700	20.9899	20.9901	20.9556	20.7928	20.5230	20.3216 (87)
Th 2	20.6247	20.6267	20.6267	20.6295	20.6295	20.6324	20.6324	20.6329	20.6310	20.6276	20.6271	20.6252 (88)
util rest of house	0.9013	0.8794	0.8345	0.7532	0.6290	0.4649	0.3667	0.3668	0.5193	0.7294	0.8480	0.9073 (89)
MIT 2	20.2494	19.9945	20.1649	20.3704	20.5278	20.6091	20.6254	20.6260	20.5963	20.4471	20.1899	19.9875 (90)
Living area fraction												0.3433 (91)
MIT	20.3701	20.1077	20.2799	20.4877	20.6490	20.7330	20.7505	20.7510	20.7197	20.5658	20.3043	20.1022 (92)
Temperature adjustment												0.0000
adjusted MIT	20.3701	20.1077	20.2799	20.4877	20.6490	20.7330	20.7505	20.7510	20.7197	20.5658	20.3043	20.1022 (93)

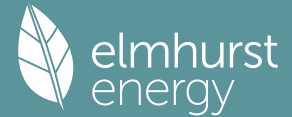
8. Space heating requirement

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8967	0.8680	0.8246	0.7476	0.6301	0.4718	0.3764	0.5260	0.7261	0.8380	0.8977 (94)	
Useful gains	675.6266	691.0455	693.3972	658.7621	557.1689	415.6137	308.1399	404.0630	527.6925	600.5245	646.5339 (95)	
Ext temp.	6.1000	6.4000	7.5000	9.3000	11.9000	14.5000	16.2000	16.3000	14.6000	11.8000	9.0000 (96)	
Heat loss rate W	998.2066	953.9458	889.3806	772.5462	604.1488	427.0513	311.7760	304.5595	420.9327	608.4547	785.6696	957.2541 (97)
Space heating kWh	239.9995	176.6690	145.8117	81.9246	34.9530	0.0000	0.0000	0.0000	60.0870	133.3045	231.1758 (98a)	
Space heating requirement - total per year (kWh/year)											1103.9252	
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 (98b)	
Solar heating contribution - total per year (kWh/year)											0.0000	
Space heating kWh	239.9995	176.6690	145.8117	81.9246	34.9530	0.0000	0.0000	0.0000	60.0870	133.3045	231.1758 (98c)	
Space heating requirement after solar contribution - total per year (kWh/year)											1103.9252	
Space heating per m2									(98c) / (4) =		11.8447 (99)	

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	239.9995	176.6690	145.8117	81.9246	34.9530	0.0000	0.0000	0.0000	60.0870	133.3045	231.1758 (98)	
Space heating efficiency (main heating system 1)	310.8111	310.8111	310.8111	310.8111	310.8111	0.0000	0.0000	0.0000	310.8111	310.8111	310.8111 (210)	
Space heating fuel (main heating system)	77.2172	56.8413	46.9133	26.3583	11.2457	0.0000	0.0000	0.0000	19.3323	42.8892	74.3782 (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 (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 (213)	
Space heating fuel (secondary)												

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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	0.0000	(215)
Water heating														
Water heating requirement														
269.4517	238.1846	252.6331	221.0015	213.5053	191.5837	188.4281	196.3117	198.9239	222.7930	238.1165	266.3493	266.3493		(64)
Efficiency of water heater														
(217)m	188.5352	188.5352	188.5352	188.5352	188.5352	188.5352	188.5352	188.5352	188.5352	188.5352	188.5352	188.5352	188.5352	(216)
Fuel for water heating, kWh/month														
142.9185	126.3343	133.9978	117.2203	113.2443	101.6170	99.9432	104.1247	105.5102	118.1705	126.2982	141.2730	141.2730		(219)
Space cooling fuel requirement														
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa														
16.0935	14.5360	16.0935	15.5743	16.0935	15.5743	16.0935	16.0935	15.5743	16.0935	15.5743	16.0935	16.0935	15.5743	(231)
Lighting														
35.0150	28.0903	25.2922	18.5302	14.3132	11.6940	13.0570	16.9720	22.0449	28.9241	32.6698	35.9881	35.9881		(232)
Electricity generated by PVs (Appendix M) (negative quantity)														
(233a)m	-97.5111	-139.1445	-236.6421	-311.2418	-352.3057	-324.3311	-320.5763	-312.2194	-255.5414	-178.7680	-111.4249	-78.1824	-78.1824	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)														
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)														
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)														
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)														
(233b)m	-1.4958	-4.2939	-15.2825	-39.4933	-64.4702	-115.2916	-80.1337	-58.3045	-32.0288	-9.8414	-2.6508	-0.9148	-0.9148	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)														
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)														
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)														
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year														
Space heating fuel - main system 1													355.1756	(211)
Space heating fuel - main system 2													0.0000	(213)
Space heating fuel - secondary													0.0000	(215)
Efficiency of water heater													188.5352	
Water heating fuel used													1430.6520	(219)
Space cooling fuel													0.0000	(221)

Electricity for pumps and fans:
 (Balanced with Heat Recovery, DataSheet: in-use factor = 1.1000, SFP = 0.6600)
 mechanical ventilation fans (SFP = 0.6600) 189.4877 (230a)
 Total electricity for the above, kWh/year 189.4877 (231)
 Electricity for lighting (calculated in Appendix L) 282.5909 (232)

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

PV generation	-3142.0900	(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	-884.1838	(238)

10a. Fuel costs - using BEDF prices (526)

	Fuel kWh/year	Fuel price p/kwh	Fuel cost £/year
Space heating - main system 1 (high-rate cost)	284.1405	22.8200	72.1717 (240)
Space heating - main system 1 (low-rate cost)	71.0351	0.1250	8.8794 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (electric off-peak tariff)			
High-rate fraction			0.7000 (243)
Low-rate fraction			0.3000 (244)
High-rate cost	1001.4564	25.4000	254.3699 (245)
Low-rate cost	429.1956	12.5000	53.6494 (246)
Energy for instantaneous electric shower(s)	0.0000	24.1100	0.0000 (247a)
Pumps, fans and electric keep-hot (0.90*25.40 + 0.10*12.50)	189.4877	24.1100	41.0411 (249)
Energy for lighting (0.90*25.40 + 0.10*12.50)	282.5909	24.1100	68.1327 (250)
Additional standing charges			5.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-2717.8886	24.1100	-655.2829
PV Unit electricity exported	-424.2014	5.5900	-23.7129
Total			-678.9958 (252)
Total energy cost			-175.7515 (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 (high-rate cost)	284.1405	0.1635	46.4575 (261)
Space heating - main system 1 (low-rate cost)	71.0351	0.1373	9.7500 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating - high rate cost	1001.4564	0.1479	148.1524 (264)
Water heating - low rate cost	429.1956	0.1242	53.2890 (264)
Space and water heating			257.6489 (265)
Pumps, fans and electric keep-hot	189.4877	0.1432	26.2928 (267)
Energy for lighting	282.5909	0.1490	42.1116 (268)

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Energy saving/generation technologies			
PV Unit electricity used in dwelling	-2717.8886	0.1367	-371.5182
PV Unit electricity exported	-424.2014	0.1147	-48.6676
Total			-420.1858 (269)
Total CO2, kg/year			-94.1324 (272)

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

	Energy Primary energy factor kWh/year	kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1 (high-rate cost)	284.1405	1.2876	457.3177 (275)
Space heating - main system 1 (low-rate cost)	71.0351	1.4969	106.3302 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating - high rate cost	1001.4564	1.5530	1555.2496 (278)
Water heating - low rate cost	429.1956	1.4443	619.9001 (278)
Space and water heating			2738.7976 (279)
Pumps, fans and electric keep-hot	189.4877	1.5335	286.6864 (281)
Energy for lighting	282.5909	1.5547	439.3566 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-2717.8886	1.5097	-4103.2132
PV Unit electricity exported	-424.2014	0.4204	-178.3405
Total			-4281.5537 (283)
Total Primary energy kWh/year			-816.7130 (286)