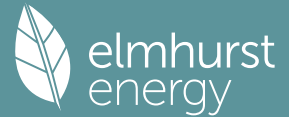


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Property Reference	AHT-7287-24		Issued on Date	05/04/2024	
Assessment Reference	SEC1 ASHP Recog Const Details	Prop Type Ref	DS		
Property	Hendra Farm, Darite, Liskeard, Cornwall, PL14 5HJ				
SAP Rating	96 A	DER	0.14	TER	7.54
Environmental	100 A	% DER < TER			98.14
CO ₂ Emissions (t/year)	-0.04	DFEE	35.79	TFEE	39.42
Compliance Check	See BREL	% DFEE < TFEE			9.20
% DPER < TPER	80.56	DPER	7.79	TPER	40.09
Assessor Details	Mr. Stuart Thomas			Assessor ID	V220-0003
Client	AT Design, Andrew Thomas				

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	135.3200 (1b)	2.5300 (2b)	342.3596 (1b) - (3b)
First floor	128.3800 (1c)	2.9100 (2c)	373.5858 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	263.7000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	715.9454 (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	2.0000	(17)
Infiltration rate	0.1000	(18)
Number of sides sheltered	2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.0850 (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	0.1084, 0.1063, 0.1041, 0.0935, 0.0914, 0.0808, 0.0808, 0.0786, 0.0850, 0.0914, 0.0956, 0.0999	(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) =		81.0000 (23c)
Effective ac	0.2034, 0.2012, 0.1991, 0.1885, 0.1864, 0.1757, 0.1757, 0.1736, 0.1800, 0.1864, 0.1906, 0.1949	(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
Window (Uw = 1.20)			38.2400	1.1450	43.7863		(27)
Door			5.8800	1.2000	7.0560		(26a)
Floor 1 P/a 0.38			135.3200	0.1200	16.2384	75.0000	10149.0000 (28a)
External Wall 1 Render	89.0400	29.2800	59.7600	0.1700	10.1592	9.0000	537.8400 (29a)
External Wall 2 Clad	117.6500	12.7400	104.9100	0.1700	17.8347	9.0000	944.1900 (29a)
External Wall 3 Stone	53.7600	2.1000	51.6600	0.1700	8.7822	9.0000	464.9400 (29a)
External Roof 1 Horz	87.8200		87.8200	0.1000	8.7820	9.0000	790.3800 (30)
External Roof 2 sloping	57.9900		57.9900	0.1300	7.5387	9.0000	521.9100 (30)
Total net area of external elements Aum(A, m ²)			541.5800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	120.1775		(33)
Internal Wall 1 GF			91.2000			9.0000	820.8000 (32c)
Internal Wall 2 FF			185.5400			9.0000	1669.8600 (32c)
Internal Floor 1			128.3800			18.0000	2310.8400 (32d)
Internal Ceiling 1			128.3800			9.0000	1155.4200 (32e)

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Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 19365.1800 (34)
 Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 73.4364 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E16 Corner (normal)	30.0000	0.0300	0.9000
E5 Ground floor (normal)	51.3000	0.0210	1.0773
E10 Eaves (insulation at ceiling level)	30.5000	0.0440	1.3420
E6 Intermediate floor within a dwelling	51.3000	0.0800	4.1040
E11 Eaves (insulation at rafter level)	16.0500	0.0390	0.6260
E13 Gable (insulation at rafter level)	5.8000	0.0240	0.1392
R4 Ridge (vaulted ceiling)	7.6300	0.1200	0.9156
E17 Corner (inverted - internal area greater than external area)	10.0000	-0.0150	-0.1500
E2 Other lintels (including other steel lintels)	34.9000	0.0840	2.9316
E3 Sill	32.1000	0.0430	1.3803
E4 Jamb	64.8000	0.0340	2.2032

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 15.4691 (36)
 Point Thermal bridges (36a) = 0.0000
 Total fabric heat loss (33) + (36) + (36a) = 135.6466 (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	48.0498	47.5477	47.0457	44.5354	44.0333	41.5230	41.5230	41.0210	42.5272	44.0333	45.0374	46.0416 (38)
Average = Sum(39)m / 12 =	183.6964	183.1943	182.6923	180.1820	179.6799	177.1697	177.1697	176.6676	178.1738	179.6799	180.6840	181.6882 (39)
HLP	0.6966	0.6947	0.6928	0.6833	0.6814	0.6719	0.6719	0.6700	0.6757	0.6814	0.6852	0.6890 (40)
HLP (average)												0.6828
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy 3.0847 (42)

Hot water usage for mixer showers 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (42a)

Hot water usage for baths 87.6146 86.3134 84.4810 81.1025 78.5727 75.7675 74.2523 76.0718 78.0530 81.0546 84.5027 87.3184 (42b)

Hot water usage for other uses 46.2208 44.5401 42.8593 41.1786 39.4978 37.8170 37.8170 39.4978 41.1786 42.8593 44.5401 46.2208 (42c)

Average daily hot water use (litres/day) 123.2515 (43)

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	133.8354	130.8534	127.3403	122.2810	118.0705	113.5845	112.0693	115.5696	119.2315	123.9139	129.0428	133.5392 (44)
Energy content (annual)	211.9626	186.3336	195.7173	167.3966	158.9455	139.6654	135.5381	143.0993	147.0244	168.1500	183.8451	209.0901 (45)
Distribution loss (46)m = 0.15 x (45)m	31.7944	27.9500	29.3576	25.1095	23.8418	20.9498	20.3307	21.4649	22.0537	25.2225	27.5768	31.3635 (46)
Water storage loss:												
Store volume												250.0000 (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												
Primary 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 (57)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	258.6610	228.5128	242.4157	212.5886	205.6439	184.8574	182.2365	189.7977	192.2164	214.8484	229.0371	255.7885 (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	258.6610	228.5128	242.4157	212.5886	205.6439	184.8574	182.2365	189.7977	192.2164	214.8484	229.0371	255.7885 (64)
12Total per year (kWh/year)												2596.6042 (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	107.8363	95.6993	102.4347	91.8130	90.2081	82.5924	82.4252	84.9393	85.0392	93.2686	97.2821	106.8812 (65)

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

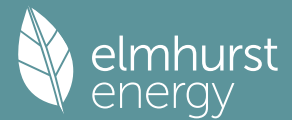
Metabolic gains (Table 5), Watts

(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	229.9286	254.5638	229.9286	237.5928	229.9286	237.5928	229.9286	229.9286	237.5928	229.9286	237.5928	229.9286 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	428.1583	432.6013	421.4052	397.5701	367.4825	339.2045	320.3130	315.8701	327.0661	350.9013	380.9888	409.2669 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	38.4237	38.4237	38.4237	38.4237	38.4237	38.4237	38.4237	38.4237	38.4237	38.4237	38.4237	38.4237 (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)	-123.3896	-123.3896	-123.3896	-123.3896	-123.3896	-123.3896	-123.3896	-123.3896	-123.3896	-123.3896	-123.3896	-123.3896 (71)
Water heating gains (Table 5)	144.9412	142.4096	137.6811	127.5180	121.2475	114.7116	110.7865	114.1657	118.1100	125.3610	135.1140	143.6575 (72)
Total internal gains	872.2992	898.8458	858.2860	831.9521	787.9297	760.7800	730.2992	729.2354	752.0401	775.4619	822.9668	852.1240 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
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North			12.9700	10.6334	0.7600	0.7000	0.7700	50.8460 (74)
East			4.2600	19.6403	0.7600	0.7000	0.7700	30.8462 (76)
South			17.5400	46.7521	0.7600	0.7000	0.7700	302.3258 (78)
West			3.4700	19.6403	0.7600	0.7000	0.7700	25.1259 (80)

Solar gains	409.1439	701.7944	976.1443	1241.0411	1422.3919	1427.2645	1369.6576	1231.4219	1067.0916	779.6365	490.8749	349.6538 (83)
Total gains	1281.4432	1600.6402	1834.4303	2072.9932	2210.3216	2188.0445	2099.9568	1960.6572	1819.1317	1555.0984	1313.8417	1201.7779 (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	29.2832	29.3634	29.4441	29.8544	29.9378	30.3620	30.3620	30.4482	30.1908	29.9378	29.7714	29.6069
alpha	2.9522	2.9576	2.9629	2.9903	2.9959	3.0241	3.0241	3.0299	3.0127	2.9959	2.9848	2.9738
util living area	0.9543	0.9177	0.8650	0.7680	0.6374	0.4814	0.3593	0.3972	0.5909	0.8139	0.9254	0.9611 (86)
Living	19.3297	19.6379	19.9928	20.3945	20.6732	20.8292	20.8770	20.8694	20.7655	20.3815	19.7907	19.2797
Non living	18.3255	18.7151	19.1604	19.6601	19.9917	20.1725	20.2196	20.2150	20.1048	19.6544	18.9182	18.2670
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	4	0	0	0	0	0	0	0	0	0	0	0
16 / 9	27	0	0	0	0	0	0	0	0	0	0	30
MIT	20.1761	19.6379	19.9928	20.3945	20.6732	20.8292	20.8770	20.8694	20.7655	20.3815	19.7907	20.0016 (87)
Th 2	20.3438	20.3455	20.3472	20.3556	20.3573	20.3658	20.3658	20.3674	20.3624	20.3573	20.3539	20.3506 (88)
util rest of house	0.9498	0.9100	0.8527	0.7478	0.6073	0.4408	0.3109	0.3472	0.5501	0.7927	0.9172	0.9572 (89)
MIT 2	19.5679	18.7151	19.1604	19.6601	19.9917	20.1725	20.2196	20.2150	20.1048	19.6544	18.9182	19.3934 (90)
Living area fraction												fLA = Living area / (4) =
MIT	19.8120	19.0855	19.4945	19.9549	20.2652	20.4361	20.4835	20.4776	20.3700	19.9463	19.2684	19.6375 (92)
Temperature adjustment												0.0000
adjusted MIT	19.8120	19.0855	19.4945	19.9549	20.2652	20.4361	20.4835	20.4776	20.3700	19.9463	19.2684	19.6375 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9457	0.8926	0.8346	0.7342	0.6028	0.4454	0.3200	0.3560	0.5506	0.7778	0.9007	0.9524 (94)
Useful gains	1211.8563	1428.7518	1530.9969	1522.0861	1332.3313	974.5435	672.0142	698.0545	1001.5892	1209.5179	1183.3598	1144.5638 (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	2849.5019	2598.7063	2373.9881	1991.8889	1538.9999	1033.9721	688.0323	720.3866	1117.1478	1679.3369	2198.6374	2804.8089 (97)
Space heating kWh	1218.4083	786.2094	627.1854	338.2580	153.7614	0.0000	0.0000	0.0000	0.0000	349.5453	730.9999	1235.2224 (98a)
Space heating requirement - total per year (kWh/year)												5439.5902
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	1218.4083	786.2094	627.1854	338.2580	153.7614	0.0000	0.0000	0.0000	0.0000	349.5453	730.9999	1235.2224 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												5439.5902
Space heating per m2												(98c) / (4) = 20.6279 (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 %)												419.3694 (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	1218.4083	786.2094	627.1854	338.2580	153.7614	0.0000	0.0000	0.0000	0.0000	349.5453	730.9999	1235.2224 (98)
Space heating efficiency (main heating system 1)	419.3694	419.3694	419.3694	419.3694	419.3694	0.0000	0.0000	0.0000	0.0000	419.3694	419.3694	419.3694 (210)
Space heating fuel (main heating system)	290.5334	187.4742	149.5544	80.6587	36.6649	0.0000	0.0000	0.0000	0.0000	83.3502	174.3093	294.5428 (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	258.6610	228.5128	242.4157	212.5886	205.6439	184.8574	182.2365	189.7977	192.2164	214.8484	229.0371	255.7885 (64)
Efficiency of water heater (217)m	199.4354	199.4354	199.4354	199.4354	199.4354	199.4354	199.4354	199.4354	199.4354	199.4354	199.4354	199.4354 (216)
Fuel for water heating, kWh/month	129.6966	114.5798	121.5510	106.5952	103.1130	92.6904	91.3762	95.1675	96.3803	107.7283	114.8427	128.2563 (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	62.0176	56.0159	62.0176	60.0170	62.0176	60.0170	62.0176	62.0176	60.0170	62.0176	60.0170	62.0176 (231)
Lighting	44.4546	35.6631	32.1107	23.5256	18.1719	14.8466	16.5770	21.5474	27.9880	36.7217	41.4771	45.6901 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-80.7718	-116.7523	-171.7839	-194.6932	-209.6807	-191.9853	-189.7112	-177.7403	-155.9017	-132.5224	-88.9859	-69.3957 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity) (233b)m	-31.9228	-71.3027	-148.4951	-234.5439	-320.6056	-329.3705	-324.7547	-271.7512	-196.1402	-107.8808	-44.6862	-24.9105 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												

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(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year														
Space heating fuel - main system 1													1297.0879	(211)
Space heating fuel - main system 2													0.0000	(213)
Space heating fuel - secondary													0.0000	(215)
Efficiency of water heater													199.4354	
Water heating fuel used													1301.9774	(219)
Space cooling fuel													0.0000	(221)
Electricity for pumps and fans:														
(BalancedWithHeatRecovery, Database: in-use factor = 1.1000, SFP = 0.8360)														
mechanical ventilation fans (SFP = 0.8360)													730.2070	(230a)
Total electricity for the above, kWh/year													730.2070	(231)
Electricity for lighting (calculated in Appendix L)													358.7737	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV generation													-3886.2886	(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													-198.2426	(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	1297.0879	0.1559	202.2754	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1301.9774	0.1409	183.5055	(264)
Space and water heating			385.7809	(265)
Pumps, fans and electric keep-hot	730.2070	0.1387	101.2887	(267)
Energy for lighting	358.7737	0.1443	51.7821	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1779.9244	0.1345	-239.4426	
PV Unit electricity exported	-2106.3642	0.1244	-262.0202	
Total			-501.4628	(269)
Total CO2, kg/year			37.3889	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			0.1400	(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	1297.0879	1.5773	2045.8900	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1301.9774	1.5212	1980.5169	(278)
Space and water heating			4026.4069	(279)
Pumps, fans and electric keep-hot	730.2070	1.5128	1104.6572	(281)
Energy for lighting	358.7737	1.5338	550.2991	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1779.9244	1.4972	-2664.8725	
PV Unit electricity exported	-2106.3642	0.4565	-961.6454	
Total			-3626.5179	(283)
Total Primary energy kWh/year			2054.8452	(286)
Dwelling Primary energy Rate (DPER)			7.7900	(287)

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

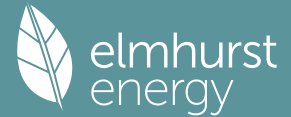
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)	
Ground floor	135.3200 (1b)	x 2.5300 (2b)	= 342.3596 (1b) - (3b)	
First floor	128.3800 (1c)	x 2.9100 (2c)	= 373.5858 (1c) - (3c)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	263.7000		(4)	
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 715.9454 (5)	

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)	
Number of open flues	0 * 20 =	0.0000 (6b)	
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)	
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)	
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)	
Number of blocked chimneys	0 * 20 =	0.0000 (6f)	
Number of intermittent extract fans	4 * 10 =	40.0000 (7a)	
Number of passive vents	0 * 10 =	0.0000 (7b)	
Number of flueless gas fires	0 * 40 =	0.0000 (7c)	
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.0559 (8)
Pressure test			Yes

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Pressure Test Method
 Measured/design AP50
 Infiltration rate
 Number of sides sheltered

Blower Door
 5.0000 (17)
 0.3059 (18)
 2 (19)

Shelter factor
 Infiltration rate adjusted to include shelter factor

(20) = 1 - [0.075 x (19)] = 0.8500 (20)
 (21) = (18) x (20) = 0.2600 (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	0.3315	0.3250	0.3185	0.2860	0.2795	0.2470	0.2470	0.2405	0.2600	0.2795	0.2925	0.3055 (22b)
Effective ac	0.5549	0.5528	0.5507	0.5409	0.5391	0.5305	0.5305	0.5289	0.5338	0.5391	0.5428	0.5467 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
TER Semi-glazed door			5.8800	1.0000	5.8800		(26a)
TER Opening Type (Uw = 1.20)			38.2400	1.1450	43.7863		(27)
Floor 1 P/a 0.38			135.3200	0.1300	17.5916		(28a)
External Wall 1 Render	89.0400	29.2800	59.7600	0.1800	10.7568		(29a)
External Wall 2 Clad	117.6500	12.7400	104.9100	0.1800	18.8838		(29a)
External Wall 3 Stone	53.7600	2.1000	51.6600	0.1800	9.2988		(29a)
External Roof 1 Horz	87.8200		87.8200	0.1100	9.6602		(30)
External Roof 2 sloping	57.9900		57.9900	0.1100	6.3789		(30)
Total net area of external elements Aum(A, m2)			541.5800				(31)
Fabric heat loss, W/K = Sum (A x U)					122.2364		(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 73.4364 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E16 Corner (normal)	30.0000	0.0900	2.7000
E5 Ground floor (normal)	51.3000	0.1600	8.2080
E10 Eaves (insulation at ceiling level)	30.5000	0.0600	1.8300
E6 Intermediate floor within a dwelling	51.3000	0.0000	0.0000
E11 Eaves (insulation at rafter level)	16.0500	0.0400	0.6420
E13 Gable (insulation at rafter level)	5.8000	0.0800	0.4640
R4 Ridge (vaulted ceiling)	7.6300	0.0800	0.6104
E17 Corner (inverted - internal area greater than external area)	10.0000	-0.0900	-0.9000
E2 Other lintels (including other steel lintels)	34.9000	0.0500	1.7450
E3 Sill	32.1000	0.0500	1.6050
E4 Jamb	64.8000	0.0500	3.2400

Thermal bridges (Sum(L x Psi) calculated using Appendix K)
 Point Thermal bridges (36a) = 20.1444 (36)
 Total fabric heat loss (33) + (36) + (36a) = 142.3808 (37)

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

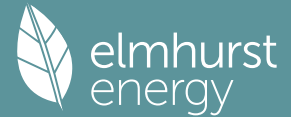
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	131.1116	130.6076	130.1135	127.7929	127.3587	125.3375	125.3375	124.9632	126.1160	127.3587	128.2370	129.1553 (38)
Average = Sum(39)m / 12 =	273.4924	272.9883	272.4943	270.1736	269.7394	267.7182	267.7182	267.3439	268.4968	269.7394	270.6178	271.5361 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0371	1.0352	1.0333	1.0245	1.0229	1.0152	1.0152	1.0138	1.0182	1.0229	1.0262	1.0297 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Hot water usage for mixer showers	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	87.6146	86.3134	84.4810	81.1025	78.5727	75.7675	74.2523	76.0718	78.0530	81.0546	84.5027	87.3184 (42b)
Hot water usage for other uses	46.2208	44.5401	42.8593	41.1786	39.4978	37.8170	37.8170	39.4978	41.1786	42.8593	44.5401	46.2208 (42c)
Average daily hot water use (litres/day)	31.7944	27.9500	29.3576	25.1095	23.8418	20.9498	20.3307	21.4649	22.0537	25.2225	27.5768	31.3635 (43)
Daily hot water use	133.8354	130.8534	127.3403	122.2810	118.0705	113.5845	112.0693	115.5696	119.2315	123.9139	129.0428	133.5392 (44)
Energy conte	211.9626	186.3336	195.7173	167.3966	158.9455	139.6654	135.5381	143.0993	147.0244	168.1500	183.8451	209.0901 (45)
Energy content (annual)												2046.7682
Distribution loss (46)m = 0.15 x (45)m	31.7944	27.9500	29.3576	25.1095	23.8418	20.9498	20.3307	21.4649	22.0537	25.2225	27.5768	31.3635 (46)
Water storage loss:												
Store volume												250.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.8903 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												1.0208 (55)
Total storage loss	31.6444	28.5820	31.6444	30.6236	31.6444	30.6236	31.6444	31.6444	30.6236	31.6444	30.6236	31.6444 (56)
If cylinder contains dedicated solar storage												
Primary loss	31.6444	28.5820	31.6444	30.6236	31.6444	30.6236	31.6444	31.6444	30.6236	31.6444	30.6236	31.6444 (57)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	266.8694	235.9268	250.6241	220.5322	213.8523	192.8010	190.4449	198.0061	200.1600	223.0568	236.9807	263.9969 (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	266.8694	235.9268	250.6241	220.5322	213.8523	192.8010	190.4449	198.0061	200.1600	223.0568	236.9807	263.9969 (64)
12Total per year (kWh/year)												2693.2514 (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												

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114.4030 101.6305 109.0015 98.1679 96.7748 88.9472 88.9919 91.5060 91.3941 99.8353 103.6370 113.4479 (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	154.2370	154.2370	154.2370	154.2370	154.2370	154.2370	154.2370	154.2370	154.2370	154.2370	154.2370	154.2370 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	229.9286	254.5638	229.9286	237.5928	229.9286	237.5928	229.9286	229.9286	237.5928	229.9286	237.5928	229.9286 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	428.1583	432.6013	421.4052	397.5701	367.4825	339.2045	320.3130	315.8701	327.0661	350.9013	380.9888	409.2669 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	38.4237	38.4237	38.4237	38.4237	38.4237	38.4237	38.4237	38.4237	38.4237	38.4237	38.4237	38.4237 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-123.3896	-123.3896	-123.3896	-123.3896	-123.3896	-123.3896	-123.3896	-123.3896	-123.3896	-123.3896	-123.3896	-123.3896 (71)
Water heating gains (Table 5)	153.7675	151.2359	146.5073	136.3442	130.0737	123.5378	119.6127	122.9919	126.9362	134.1872	143.9403	152.4837 (72)
Total internal gains	884.1255	910.6720	870.1122	843.7783	799.7559	769.6063	739.1254	738.0616	760.8663	787.2882	834.7930	863.9503 (73)

6. Solar gains

[Jan]	Area m ²	Solar flux Table 6a W/m ²	Specific data or Table 6b	g	Specific data or Table 6c	FF	Access factor Table 6d	Gains W				
North	12.9700	10.6334	0.6300	0.7000	0.7700	0.7700	42.1486 (74)					
East	4.2600	19.6403	0.6300	0.7000	0.7700	0.7700	25.5699 (76)					
South	17.5400	46.7521	0.6300	0.7000	0.7700	0.7700	250.6122 (78)					
West	3.4700	19.6403	0.6300	0.7000	0.7700	0.7700	20.8281 (80)					
Solar gains	339.1588	581.7506	809.1723	1028.7578	1179.0880	1183.1272	1135.3741	1020.7839	884.5628	646.2776	406.9095	289.8446 (83)
Total gains	1223.2842	1492.4226	1679.2845	1872.5361	1978.8439	1952.7334	1874.4995	1758.8455	1645.4291	1433.5658	1241.7025	1153.7949 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains for living area, nil,m (see Table 9a)	tau	19.6686	19.7049	19.7407	19.9102	19.9423	20.0928	20.0928	20.1210	20.0346	19.9423	19.8775	19.8103
	alpha	2.3112	2.3137	2.3160	2.3273	2.3295	2.3395	2.3395	2.3414	2.3356	2.3295	2.3252	2.3207
util living area	0.9647	0.9442	0.9158	0.8615	0.7775	0.6536	0.5285	0.5687	0.7405	0.8854	0.9478	0.9689 (86)	
MIT	17.7303	18.1152	18.6666	19.3928	20.0577	20.5740	20.8174	20.7762	20.3828	19.5081	18.4931	17.6649 (87)	
Th 2	20.0525	20.0541	20.0556	20.0629	20.0643	20.0707	20.0707	20.0718	20.0682	20.0643	20.0615	20.0586 (88)	
util rest of house	0.9604	0.9374	0.9052	0.8428	0.7441	0.5951	0.4421	0.4847	0.6909	0.8661	0.9404	0.9651 (89)	
MIT 2	16.1715	16.6601	17.3587	18.2722	19.0874	19.6923	19.9452	19.9103	19.4867	18.4299	17.1494	16.0913 (90)	
Living area fraction	16.7971	17.2442	17.8837	18.7220	19.4769	20.0462	20.2953	20.2578	19.8463	18.8627	17.6887	16.7229 (92)	
MIT	16.7971	17.2442	17.8837	18.7220	19.4769	20.0462	20.2953	20.2578	19.8463	18.8627	17.6887	16.7229 (92)	
Temperature adjustment	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
adjusted MIT	16.7971	17.2442	17.8837	18.7220	19.4769	20.0462	20.2953	20.2578	19.8463	18.8627	17.6887	16.7229 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9382	0.9093	0.8726	0.8095	0.7198	0.5934	0.4644	0.5028	0.6774	0.8342	0.9136	0.9447 (94)
Useful gains	1147.6894	1356.9919	1465.4105	1515.8787	1424.3430	1158.7256	870.4896	884.4305	1114.5683	1195.9057	1134.3816	1089.9757 (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	3417.8672	3369.8097	3101.9899	2653.6411	2097.7259	1458.0406	989.2885	1031.3694	1542.8741	2228.7667	2865.4912	3400.4219 (97)
Space heating kWh	1689.0122	1352.6136	1217.6151	819.1889	500.9969	0.0000	0.0000	0.0000	0.0000	768.4485	1246.3990	1718.9719 (98a)
Space heating requirement - total per year (kWh/year)												9313.2460
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	1689.0122	1352.6136	1217.6151	819.1889	500.9969	0.0000	0.0000	0.0000	0.0000	768.4485	1246.3990	1718.9719 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												9313.2460
Space heating per m ²										(98c) / (4) =		35.3176 (99)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												92.3000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement	1689.0122	1352.6136	1217.6151	819.1889	500.9969	0.0000	0.0000	0.0000	0.0000	768.4485	1246.3990	1718.9719 (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)	1829.9157	1465.4535	1319.1929	887.5286	542.7918	0.0000	0.0000	0.0000	0.0000	832.5553	1350.3781	1862.3748 (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)												

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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	(215)
Water heating														
Water heating requirement	266.8694	235.9268	250.6241	220.5322	213.8523	192.8010	190.4449	198.0061	200.1600	223.0568	236.9807	263.9969	263.9969	(64)
Efficiency of water heater														(216)
(217)m	87.4542	87.3371	87.1228	86.7254	85.9017	79.8000	79.8000	79.8000	79.8000	86.6027	87.2283	87.4864	87.4864	(217)
Fuel for water heating, kWh/month	305.1532	270.1336	287.6678	254.2880	248.9500	241.6053	238.6528	248.1280	250.8271	257.5634	271.6786	301.7577	301.7577	(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	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	47.7746	38.3266	34.5088	25.2826	19.5290	15.9554	17.8150	23.1567	30.0782	39.4643	44.5748	49.1024	49.1024	(232)
Electricity generated by PVs (Appendix M) (negative quantity)														
(233a)m	-107.6706	-143.0538	-193.7688	-204.6781	-209.8980	-191.8137	-189.0524	-183.3692	-172.3517	-156.6410	-115.0401	-94.1108	-94.1108	(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	-90.4645	-185.9152	-361.9080	-533.0906	-695.3041	-695.5245	-687.6708	-586.8425	-436.1261	-262.6719	-119.6530	-71.9106	-71.9106	(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													10090.1907	(211)
Space heating fuel - main system 2													0.0000	(213)
Space heating fuel - secondary													0.0000	(215)
Efficiency of water heater													79.8000	(217)
Water heating fuel used													3176.4054	(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)													385.5685	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV generation													-6688.5300	(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													7049.6346	(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	10090.1907	0.2100	2118.9401 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3176.4054	0.2100	667.0451 (264)
Space and water heating			2785.9852 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	385.5685	0.1443	55.6495 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1961.4484	0.1359	-266.6421
PV Unit electricity exported	-4727.0817	0.1265	-597.8239
Total			-864.4660 (269)
Total CO2, kg/year			1989.0979 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			7.5400 (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	10090.1907	1.1300	11401.9155 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3176.4054	1.1300	3589.3381 (278)
Space and water heating			14991.2537 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	385.5685	1.5338	591.3978 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1961.4484	1.5025	-2947.0585
PV Unit electricity exported	-4727.0817	0.4642	-2194.5402
Total			-5141.5987 (283)
Total Primary energy kWh/year			10571.1536 (286)
Target Primary Energy Rate (TPER)			40.0900 (287)

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

1. Overall dwelling characteristics

Area (m2)	Storey height (m)	Volume (m3)
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Ground floor		135.3200 (1b)	x	2.5300 (2b)	=	342.3596 (1b) - (3b)
First floor		128.3800 (1c)	x	2.9100 (2c)	=	373.5858 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	263.7000					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	715.9454 (5)

2. Ventilation rate

		m3 per hour									
Number of open chimneys		0 * 80 =		0.0000 (6a)							
Number of open flues		0 * 20 =		0.0000 (6b)							
Number of chimneys / flues attached to closed fire		0 * 10 =		0.0000 (6c)							
Number of flues attached to solid fuel boiler		0 * 20 =		0.0000 (6d)							
Number of flues attached to other heater		0 * 35 =		0.0000 (6e)							
Number of blocked chimneys		0 * 20 =		0.0000 (6f)							
Number of intermittent extract fans		4 * 10 =		40.0000 (7a)							
Number of passive vents		0 * 10 =		0.0000 (7b)							
Number of flueless gas fires		0 * 40 =		0.0000 (7c)							
		Air changes per hour									
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c)		40.0000 / (5) =		0.0559 (8)							
Pressure test				Yes							
Pressure Test Method				Blower Door							
Measured/design AP50				2.0000 (17)							
Infiltration rate				0.1559 (18)							
Number of sides sheltered				2 (19)							
Shelter factor		(20) = 1 - [0.075 x (19)] =		0.8500 (20)							
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =		0.1325 (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												
	0.1689	0.1656	0.1623	0.1457	0.1424	0.1259	0.1259	0.1226	0.1325	0.1424	0.1491	0.1557 (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	0.5143	0.5137	0.5132	0.5106	0.5101	0.5079	0.5079	0.5075	0.5088	0.5101	0.5111	0.5121 (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
Window (Uw = 1.20)			38.2400	1.1450	43.7863		(27)
Door			5.8800	1.2000	7.0560		(26a)
Floor 1 P/a 0.38			135.3200	0.1200	16.2384	75.0000	10149.0000 (28a)
External Wall 1 Render	89.0400	29.2800	59.7600	0.1700	10.1592	9.0000	537.8400 (29a)
External Wall 2 Clad	117.6500	12.7400	104.9100	0.1700	17.8347	9.0000	944.1900 (29a)
External Wall 3 Stone	53.7600	2.1000	51.6600	0.1700	8.7822	9.0000	464.9400 (29a)
External Roof 1 Horz	87.8200		87.8200	0.1000	8.7820	9.0000	790.3800 (30)
External Roof 2 sloping	57.9900		57.9900	0.1300	7.5387	9.0000	521.9100 (30)
Total net area of external elements Aum(A, m2)			541.5800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	120.1775		(33)
Internal Wall 1 GF			91.2000			9.0000	820.8000 (32c)
Internal Wall 2 FF			185.5400			9.0000	1669.8600 (32c)
Internal Floor 1			128.3800			18.0000	2310.8400 (32d)
Internal Ceiling 1			128.3800			9.0000	1155.4200 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	19365.1800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							73.4364 (35)

List of Thermal Bridges	K1 Element	Length	Psi-value	Total
	E16 Corner (normal)	30.0000	0.0300	0.9000
	E5 Ground floor (normal)	51.3000	0.0210	1.0773
	E10 Eaves (insulation at ceiling level)	30.5000	0.0440	1.3420
	E6 Intermediate floor within a dwelling	51.3000	0.0800	4.1040
	E11 Eaves (insulation at rafter level)	16.0500	0.0390	0.6260
	E13 Gable (insulation at rafter level)	5.8000	0.0240	0.1392
	R4 Ridge (vaulted ceiling)	7.6300	0.1200	0.9156
	E17 Other (inverted - internal area greater than external area)	10.0000	-0.0150	-0.1500
	E2 Other lintels (including other steel lintels)	34.9000	0.0840	2.9316
	E3 Sill	32.1000	0.0430	1.3803
	E4 Jamb	64.8000	0.0340	2.2032
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				15.4691 (36)
Point Thermal bridges				0.0000
Total fabric heat loss			(33) + (36) + (36a) =	135.6466 (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	121.5019	121.3710	121.2427	120.6401	120.5273	120.0024	120.0024	119.9052	120.2046	120.5273	120.7554	120.9939 (38)
Average = Sum(39)m / 12 =	257.1485	257.0176	256.8893	256.2867	256.1739	255.6490	255.6490	255.5518	255.8512	256.1739	256.4020	256.6405 (39)
												256.2861
HLP	0.9752	0.9747	0.9742	0.9719	0.9715	0.9695	0.9695	0.9691	0.9702	0.9715	0.9723	0.9732 (40)
HLP (average)												0.9719
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												
Hot water usage for mixer showers												3.0847 (42)
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42a)
Hot water usage for baths												
	32.7803	32.2934	31.6079	30.3438	29.3973	28.3478	27.7809	28.4616	29.2029	30.3259	31.6160	32.6694 (42b)
Hot water usage for other uses												
	46.2208	44.5401	42.8593	41.1786	39.4978	37.8170	37.8170	39.4978	41.1786	42.8593	44.5401	46.2208 (42c)
Average daily hot water use (litres/day)												72.4114 (43)

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	79.0011	76.8335	74.4672	71.5224	68.8951	66.1648	65.5979	67.9594	70.3814	73.1852	76.1561	78.8903	(44)
Energy content (annual)	125.1184	109.4099	114.4533	97.9105	92.7460	81.3574	79.3350	84.1480	86.7873	99.3116	108.4983	123.5231	(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	106.3506	92.9984	97.2853	83.2240	78.8341	69.1538	67.4347	71.5258	73.7692	84.4149	92.2235	104.9946	(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	106.3506	92.9984	97.2853	83.2240	78.8341	69.1538	67.4347	71.5258	73.7692	84.4149	92.2235	104.9946	(64)
12Total per year (kWh/year)													(64)
Electric shower(s)	60.8160	54.1875	59.1707	56.4659	57.5254	54.8737	56.7028	57.5254	56.4659	59.1707	58.0581	60.8160	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =													(64a)
Heat gains from water heating, kWh/month	41.7916	36.7965	39.1140	34.9225	34.0899	31.0069	31.0344	32.2628	32.5588	35.8964	37.5704	41.4526	(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	154.2370	154.2370	154.2370	154.2370	154.2370	154.2370	154.2370	154.2370	154.2370	154.2370	154.2370	154.2370	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	229.9286	254.5638	229.9286	237.5928	229.9286	237.5928	229.9286	229.9286	237.5928	229.9286	237.5928	229.9286	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	428.1593	432.6013	421.4052	397.5701	367.4825	339.2045	320.3130	315.8701	327.0661	350.9013	380.9888	409.2669	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	38.4237	38.4237	38.4237	38.4237	38.4237	38.4237	38.4237	38.4237	38.4237	38.4237	38.4237	38.4237	(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)	-123.3896	-123.3896	-123.3896	-123.3896	-123.3896	-123.3896	-123.3896	-123.3896	-123.3896	-123.3896	-123.3896	-123.3896	(71)
Water heating gains (Table 5)	56.1716	54.7567	52.5726	48.5034	45.8197	43.0651	41.7129	43.3640	45.2205	48.2478	52.1811	55.7159	(72)
Total internal gains	783.5296	811.1928	773.1775	752.9375	712.5020	689.1335	661.2255	658.4337	679.1506	698.3488	740.0339	764.1825	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	FF Access factor Table 6d	Gains W							
North	12.9700	10.6334	0.7600	0.7000	0.7700	50.8460 (74)							
East	4.2600	19.6403	0.7600	0.7000	0.7700	30.8462 (76)							
South	17.5400	46.7521	0.7600	0.7000	0.7700	302.3258 (78)							
West	3.4700	19.6403	0.7600	0.7000	0.7700	25.1259 (80)							
Solar gains	409.1439	701.7944	976.1443	1241.0411	1422.3919	1427.2645	1369.6576	1231.4219	1067.0916	779.6365	490.8749	349.6538	(83)
Total gains	1192.6735	1512.9872	1749.3218	1993.9786	2134.8939	2116.3980	2030.8832	1889.8556	1746.2422	1477.9853	1230.9088	1113.8363	(84)

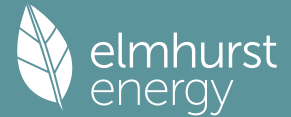
7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation factor for gains for living area, nil,m (see Table 9a)	tau	20.9187	20.9294	20.9398	20.9891	20.9983	21.0414	21.0414	21.0494	21.0248	20.9983	20.9796	20.9601	(85)
util living area	alpha	2.3946	2.3953	2.3960	2.3993	2.3999	2.4028	2.4028	2.4033	2.4017	2.3999	2.3986	2.3973	
MIT	0.9660	0.9411	0.9061	0.8408	0.7435	0.6111	0.4849	0.5283	0.7099	0.8749	0.9475	0.9708	(86)	
MIT 2	17.8832	18.3073	18.8765	19.5849	20.2100	20.6591	20.8607	20.8238	20.4773	19.6377	18.6187	17.7932	(87)	
Th 2	20.1041	20.1045	20.1049	20.1068	20.1072	20.1089	20.1089	20.1092	20.1082	20.1072	20.1065	20.1057	(88)	
util rest of house	0.9619	0.9342	0.8948	0.8208	0.7090	0.5539	0.4048	0.4489	0.6598	0.8549	0.9402	0.9673	(89)	
MIT 2	17.2110	17.6298	18.1901	18.8795	19.4712	19.8741	20.0343	20.0102	19.7255	18.9428	17.9438	17.1229	(90)	
Living area fraction	MIT	17.4807	17.9017	18.4656	19.1626	19.7677	20.1891	20.3660	20.3368	20.0273	19.2217	18.2147	17.3919	(92)
Temperature adjustment	adjusted MIT	17.4807	17.9017	18.4656	19.1626	19.7677	20.1891	20.3660	20.3368	20.0273	19.2217	18.2147	17.3919	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9453	0.9120	0.8691	0.7959	0.6943	0.5594	0.4290	0.4704	0.6548	0.8306	0.9195	0.9522	(94)
Ext temp.	1127.4051	1379.8689	1520.2575	1587.0380	1482.3381	1183.8848	871.3060	888.9521	1143.4302	1227.6393	1131.8489	1060.6080	(95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Space heating kWh	3389.4098	3341.6763	3073.8387	2630.1744	2066.7434	1428.8543	962.7708	1006.0457	1516.4977	2208.6493	2849.8286	3385.5748	(97)
Space heating requirement - total per year (kWh/year)	1682.9315	1318.3346	1155.8644	751.0582	434.7975	0.0000	0.0000	0.0000	0.0000	729.8714	1236.9453	1729.7753	(98a)
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)

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Solar heating contribution - total per year (kWh/year)												0.0000
Space heating kWh	1682.9315	1318.3346	1155.8644	751.0582	434.7975	0.0000	0.0000	0.0000	0.0000	729.8714	1236.9453	1729.7753 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												9039.5784
Space heating per m2												(98c) / (4) = 34.2798 (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	2403.1009	1891.8029	1942.1940	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.6991	0.7660	0.7333	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1680.0008	1449.1759	1424.2549	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	2355.9775	2260.7165	2100.6800	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	486.7032	603.7862	503.2603	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	121.6758	150.9466	125.8151	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												398.4374 (107)
Energy for space heating												34.2798 (99)
Energy for space cooling												1.5109 (108)
Total												35.7907 (109)
Fabric Energy Efficiency (DFEE)												35.8 (109)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	135.3200 (1b)	x 2.5300 (2b)	= 342.3596 (1b) - (3b)
First floor	128.3800 (1c)	x 2.9100 (2c)	= 373.5858 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	263.7000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 715.9454 (5)

2. Ventilation rate

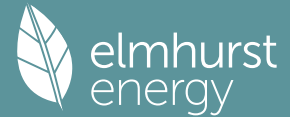
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	4 * 10 =	40.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.0559 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3059 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2600 (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	0.3315	0.3250	0.3185	0.2860	0.2795	0.2470	0.2470	0.2405	0.2600	0.2795	0.2925	0.3055 (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	0.5549	0.5528	0.5507	0.5409	0.5391	0.5305	0.5305	0.5289	0.5338	0.5391	0.5428	0.5467 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
TER Semi-glazed door			5.8800	1.0000	5.8800		(26a)
TER Opening Type (Uw = 1.20)			38.2400	1.1450	43.7863		(27)
Floor 1 P/a 0.38			135.3200	0.1300	17.5916		(28a)
External Wall 1 Render	89.0400	29.2800	59.7600	0.1800	10.7568		(29a)
External Wall 2 Clad	117.6500	12.7400	104.9100	0.1800	18.8838		(29a)
External Wall 3 Stone	53.7600	2.1000	51.6600	0.1800	9.2988		(29a)
External Roof 1 Horz	87.8200		87.8200	0.1100	9.6602		(30)
External Roof 2 sloping	57.9900		57.9900	0.1100	6.3789		(30)
Total net area of external elements Aum(A, m2)			541.5800				(31)

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Fabric heat loss, W/K = Sum (A x U) (26)...(30) + (32) = 122.2364 (33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 73.4364 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E16 Corner (normal)	30.0000	0.0900	2.7000
E5 Ground floor (normal)	51.3000	0.1600	8.2080
E10 Eaves (insulation at ceiling level)	30.5000	0.0600	1.8300
E6 Intermediate floor within a dwelling	51.3000	0.0000	0.0000
E11 Eaves (insulation at rafter level)	16.0500	0.0400	0.6420
E13 Gable (insulation at rafter level)	5.8000	0.0800	0.4640
R4 Ridge (vaulted ceiling)	7.6300	0.0800	0.6104
E17 Corner (inverted - internal area greater than external area)	10.0000	-0.0900	-0.9000
E2 Other lintels (including other steel lintels)	34.9000	0.0500	1.7450
E3 Sill	32.1000	0.0500	1.6050
E4 Jamb	64.8000	0.0500	3.2400

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 20.1444 (36)
 Point Thermal bridges (36a) = 0.0000
 Total fabric heat loss (33) + (36) + (36a) = 142.3808 (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	131.1116	130.6076	130.1135	127.7929	127.3587	125.3375	125.3375	124.9632	126.1160	127.3587	128.2370	129.1553
Average = Sum(39)m / 12 =	273.4924	272.9883	272.4943	270.1736	269.7394	267.7182	267.7182	267.3439	268.4968	269.7394	270.6178	271.5361

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0371	1.0352	1.0333	1.0245	1.0229	1.0152	1.0152	1.0138	1.0182	1.0229	1.0262	1.0297
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy 3.0847 (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 32.7803 32.2934 31.6079 30.3438 29.3973 28.3478 27.7809 28.4616 29.2029 30.3259 31.6160 32.6694 (42b)

Hot water usage for other uses 46.2208 44.5401 42.8593 41.1786 39.4978 37.8170 37.8170 39.4978 41.1786 42.8593 44.5401 46.2208 (42c)

Average daily hot water use (litres/day) 72.4114 (43)

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	79.0011	76.8335	74.4672	71.5224	68.8951	66.1648	65.5979	67.9594	70.3814	73.1852	76.1561	78.8903
Energy content (annual)	125.1184	109.4099	114.4533	97.9105	92.7460	81.3574	79.3350	84.1480	86.7873	99.3116	108.4983	123.5231
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
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
If cylinder contains dedicated solar storage												
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
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
Total heat required for water heating calculated for each month	106.3506	92.9984	97.2853	83.2240	78.8341	69.1538	67.4347	71.5258	73.7692	84.4149	92.2235	104.9946
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
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
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
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
Output from w/h	106.3506	92.9984	97.2853	83.2240	78.8341	69.1538	67.4347	71.5258	73.7692	84.4149	92.2235	104.9946
12Total per year (kWh/year)	Total per year (kWh/year) = Sum(64)m = 1022.2090 (64)											1022 (64)
Electric shower(s)	60.8160	54.1875	59.1707	56.4659	57.5254	54.8737	56.7028	57.5254	56.4659	59.1707	58.0581	60.8160
Heat gains from water heating, kWh/month	41.7916	36.7965	39.1140	34.9225	34.0899	31.0069	31.0344	32.2628	32.5588	35.8964	37.5704	41.4526

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

Metabolic gains (Table 5), Watts

(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	229.9286	254.5638	229.9286	237.5928	229.9286	237.5928	229.9286	229.9286	237.5928	229.9286	237.5928	229.9286
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	428.1583	432.6013	421.4052	397.5701	367.4825	339.2045	320.3130	315.8701	327.0661	350.9013	380.9888	409.2669
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	38.4237	38.4237	38.4237	38.4237	38.4237	38.4237	38.4237	38.4237	38.4237	38.4237	38.4237	38.4237
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)	-123.3896	-123.3896	-123.3896	-123.3896	-123.3896	-123.3896	-123.3896	-123.3896	-123.3896	-123.3896	-123.3896	-123.3896
Water heating gains (Table 5)	56.1716	54.7567	52.5726	48.5034	45.8197	43.0651	41.7129	43.3640	45.2205	48.2478	52.1811	55.7159
Total internal gains	783.5296	811.1928	773.1775	752.9375	712.5020	689.1335	661.2255	658.4337	679.1506	698.3488	740.0339	764.1825

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
North	12.9700	10.6334	0.6300	0.7000	0.7700	42.1486 (74)
East	4.2600	19.6403	0.6300	0.7000	0.7700	25.5699 (76)
South	17.5400	46.7521	0.6300	0.7000	0.7700	250.6122 (78)

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West		3.4700	19.6403	0.6300	0.7000	0.7700	20.8281 (80)					
Solar gains	339.1588	581.7506	809.1723	1028.7578	1179.0880	1183.1272	1135.3741	1020.7839	884.5628	646.2776	406.9095	289.8446 (83)
Total gains	1122.6884	1392.9435	1582.3497	1781.6953	1891.5900	1872.2607	1796.5996	1679.2176	1563.7134	1344.6264	1146.9433	1054.0271 (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	19.6686	19.7049	19.7407	19.9102	19.9423	20.0928	20.0928	20.1210	20.0346	19.9423	19.8775	19.8103
alpha	2.3112	2.3137	2.3160	2.3273	2.3295	2.3395	2.3395	2.3414	2.3356	2.3295	2.3252	2.3207
util living area	0.9703	0.9511	0.9244	0.8722	0.7909	0.6689	0.5444	0.5862	0.7570	0.8972	0.9552	0.9741 (86)
MIT	17.6426	18.0337	18.5939	19.3354	20.0165	20.5508	20.8052	20.7607	20.3490	19.4471	18.4143	17.5766 (87)
Th 2	20.0525	20.0541	20.0556	20.0629	20.0643	20.0707	20.0707	20.0718	20.0682	20.0643	20.0615	20.0586 (88)
util rest of house	0.9666	0.9451	0.9146	0.8545	0.7586	0.6109	0.4571	0.5017	0.7087	0.8794	0.9487	0.9709 (89)
MIT 2	16.9413	17.3292	17.8834	18.6134	19.2666	19.7580	19.9655	19.9361	19.5872	18.7333	17.7149	16.8795 (90)
Living area fraction	17.2228	17.6120	18.1686	18.9032	19.5676	20.0762	20.3025	20.2671	19.8930	19.0198	17.9956	17.1593 (92)
Temperature adjustment												0.0000
adjusted MIT	17.2228	17.6120	18.1686	18.9032	19.5676	20.0762	20.3025	20.2671	19.8930	19.0198	17.9956	17.1593 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9507	0.9239	0.8893	0.8277	0.7388	0.6113	0.4804	0.5209	0.6983	0.8542	0.9289	0.9565 (94)
Ext temp.	1067.3509	1286.8950	1407.1311	1474.7451	1397.4505	1144.4794	863.1259	874.7567	1091.9988	1148.6243	1065.4086	1008.1887 (95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Space heating kWh	3534.2844	3470.2223	3179.6233	2702.6057	2122.1954	1466.0743	991.2393	1033.8422	1555.3916	2271.1410	2948.5491	3518.9187 (97)
Space heating requirement - total per year (kWh/year)	1835.3986	1467.1959	1318.7342	884.0596	539.2102	0.0000	0.0000	0.0000	0.0000	835.1524	1355.8611	1867.9831 (98a)
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Space heating requirement after solar contribution - total per year (kWh/year)	1835.3986	1467.1959	1318.7342	884.0596	539.2102	0.0000	0.0000	0.0000	0.0000	835.1524	1355.8611	1867.9831 (98c)
Space heating per m2												10103.5952
												(98c) / (4) =
												38.3147 (99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b												
Ext. temp.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	2516.5514	1981.1149	2031.8139	0.0000	0.0000	0.0000	0.0000 (100)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.6298	0.7016	0.6681	0.0000	0.0000	0.0000	0.0000 (101)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1584.9199	1389.8965	1357.5110	0.0000	0.0000	0.0000	0.0000 (102)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	2070.6221	1986.8786	1854.4798	0.0000	0.0000	0.0000	0.0000 (103)
Cooled fraction	0.0000	0.0000	0.0000	0.0000	0.0000	349.7056	444.1547	369.7448	0.0000	0.0000	0.0000	0.0000 (104)
Intermittency factor (Table 10b)												fc = cooled area / (4) =
Space cooling kWh	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (105)
Space cooling requirement	0.0000	0.0000	0.0000	0.0000	0.0000	87.4264	111.0387	92.4362	0.0000	0.0000	0.0000	0.0000 (107)
Energy for space heating												290.9013 (107)
Energy for space cooling												38.3147 (99)
Total												1.1032 (108)
Fabric Energy Efficiency (TFEE)												39.4179 (109)
												39.4 (109)

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

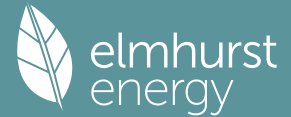
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	135.3200 (1b)	x 2.5300 (2b)	= 342.3596 (1b) - (3b)
First floor	128.3800 (1c)	x 2.9100 (2c)	= 373.5858 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	263.7000		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 715.9454 (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)

Full SAP Calculation Printout



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 2.0000 (17)
 Infiltration rate 0.1000 (18)
 Number of sides sheltered 2 (19)

Shelter factor (20) = 1 - [0.075 x (19)] = 0.8500 (20)
 Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.0850 (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	0.1084	0.1063	0.1041	0.0935	0.0914	0.0808	0.0808	0.0786	0.0850	0.0914	0.0956	0.0999 (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) =												81.0000 (23c)
Effective ac	0.2034	0.2012	0.1991	0.1885	0.1864	0.1757	0.1757	0.1736	0.1800	0.1864	0.1906	0.1949 (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
Window (Uw = 1.20)			38.2400	1.1450	43.7863		(27)
Door			5.8800	1.2000	7.0560		(26a)
Floor 1 P/a 0.38			135.3200	0.1200	16.2384	75.0000	10149.0000 (28a)
External Wall 1 Render	89.0400	29.2800	59.7600	0.1700	10.1592	9.0000	537.8400 (29a)
External Wall 2 Clad	117.6500	12.7400	104.9100	0.1700	17.8347	9.0000	944.1900 (29a)
External Wall 3 Stone	53.7600	2.1000	51.6600	0.1700	8.7822	9.0000	464.9400 (29a)
External Roof 1 Horz	87.8200		87.8200	0.1000	8.7820	9.0000	790.3800 (30)
External Roof 2 sloping	57.9900		57.9900	0.1300	7.5387	9.0000	521.9100 (30)
Total net area of external elements Aum(A, m2)			541.5800				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 120.1775		(33)
Internal Wall 1 GF			91.2000			9.0000	820.8000 (32c)
Internal Wall 2 FF			185.5400			9.0000	1669.8600 (32c)
Internal Floor 1			128.3800			18.0000	2310.8400 (32d)
Internal Ceiling 1			128.3800			9.0000	1155.4200 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 19365.1800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							73.4364 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E16 Corner (normal)	30.0000	0.0300	0.9000
E5 Ground floor (normal)	51.3000	0.0210	1.0773
E10 Eaves (insulation at ceiling level)	30.5000	0.0440	1.3420
E6 Intermediate floor within a dwelling	51.3000	0.0800	4.1040
E11 Eaves (insulation at rafter level)	16.0500	0.0390	0.6260
E13 Gable (insulation at rafter level)	5.8000	0.0240	0.1392
R4 Ridge (vaulted ceiling)	7.6300	0.1200	0.9156
E17 Corner (inverted - internal area greater than external area)	10.0000	-0.0150	-0.1500
E2 Other lintels (including other steel lintels)	34.9000	0.0840	2.9316
E3 Sill	32.1000	0.0430	1.3803
E4 Jamb	64.8000	0.0340	2.2032

Thermal bridges (Sum(L x Psi) calculated using Appendix K)
 Point Thermal bridges (36a) = 0.0000
 Total fabric heat loss (33) + (36) + (36a) = 135.6466 (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	48.0498	47.5477	47.0457	44.5354	44.0333	41.5230	41.5230	41.0210	42.5272	44.0333	45.0374	46.0416 (38)
Heat transfer coeff	183.6964	183.1943	182.6923	180.1820	179.6799	177.1697	177.1697	176.6676	178.1738	179.6799	180.6840	181.6882 (39)
Average = Sum(39)m / 12 =												180.0565

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.6966	0.6947	0.6928	0.6833	0.6814	0.6719	0.6719	0.6700	0.6757	0.6814	0.6852	0.6890 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

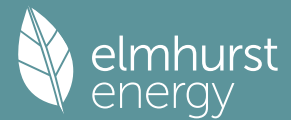
4. Water heating energy requirements (kWh/year)

Assumed occupancy 3.0847 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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	87.6146	86.3134	84.4810	81.1025	78.5727	75.7675	74.2523	76.0718	78.0530	81.0546	84.5027	87.3184 (42b)
Hot water usage for other uses	46.2208	44.5401	42.8593	41.1786	39.4978	37.8170	37.8170	39.4978	41.1786	42.8593	44.5401	46.2208 (42c)
Average daily hot water use (litres/day)												123.2515 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	133.8354	130.8534	127.3403	122.2810	118.0705	113.5845	112.0693	115.5696	119.2315	123.9139	129.0428	133.5392 (44)
Energy conte	211.9626	186.3336	195.7173	167.3966	158.9455	139.6654	135.5381	143.0993	147.0244	168.1500	183.8451	209.0901 (45)
Energy content (annual)												Total = Sum(45)m = 2046.7682
Distribution loss (46)m = 0.15 x (45)m												
	31.7944	27.9500	29.3576	25.1095	23.8418	20.9498	20.3307	21.4649	22.0537	25.2225	27.5768	31.3635 (46)
Water storage loss:												
Store volume												250.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.4000 (48)
Temperature factor from Table 2b												0.5400 (49)

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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	258.6610	228.5128	242.4157	212.5886	205.6439	184.8574	182.2365	189.7977	192.2164	214.8484	229.0371	255.7885 (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	258.6610	228.5128	242.4157	212.5886	205.6439	184.8574	182.2365	189.7977	192.2164	214.8484	229.0371	255.7885 (64)
	Total per year (kWh/year) = Sum(64)m =											2596.6042 (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	107.8363	95.6993	102.4347	91.8130	90.2081	82.5924	82.4252	84.9393	85.0392	93.2686	97.2821	106.8812 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	185.0844	185.0844	185.0844	185.0844	185.0844	185.0844	185.0844	185.0844	185.0844	185.0844	185.0844	185.0844 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	50.7881	45.1096	36.6856	27.7733	20.7609	17.5272	18.9388	24.6173	33.0413	41.9536	48.9660	52.1997 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	639.0423	645.6736	628.9630	593.3882	548.4814	506.2753	478.0791	471.4478	488.1584	523.7332	568.6400	610.8461 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	56.5932	56.5932	56.5932	56.5932	56.5932	56.5932	56.5932	56.5932	56.5932	56.5932	56.5932	56.5932 (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)	-123.3896	-123.3896	-123.3896	-123.3896	-123.3896	-123.3896	-123.3896	-123.3896	-123.3896	-123.3896	-123.3896	-123.3896 (71)
Water heating gains (Table 5)	144.9412	142.4096	137.6811	127.5180	121.2475	114.7116	110.7865	114.1657	118.1100	125.3610	135.1140	143.6575 (72)
Total internal gains	953.0597	951.4807	921.6177	866.9675	808.7777	756.8022	726.0924	728.5188	757.5978	809.3358	871.0080	924.9913 (73)

6. Solar gains

[Jan]		Area	Solar flux	g	FF	Access	Gains					
		m2	Table 6a	Specific data	Specific data	factor	W					
			W/m2	or Table 6b	or Table 6c	Table 6d						
North		12.9700	10.6334	0.7600	0.7000	0.7700	50.8460 (74)					
East		4.2600	19.6403	0.7600	0.7000	0.7700	30.8462 (76)					
South		17.5400	46.7521	0.7600	0.7000	0.7700	302.3258 (78)					
West		3.4700	19.6403	0.7600	0.7000	0.7700	25.1259 (80)					
Solar gains	409.1439	701.7944	976.1443	1241.0411	1422.3919	1427.2645	1369.6576	1231.4219	1067.0916	779.6365	490.8749	349.6538 (83)
Total gains	1362.2036	1653.2752	1897.7620	2108.0087	2231.1696	2184.0667	2095.7500	1959.9407	1824.6894	1588.9723	1361.8830	1274.6451 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
tau	29.2832	29.3634	29.4441	29.8544	29.9378	30.3620	30.3620	30.4482	30.1908	29.9378	29.7714	29.6069
alpha	2.9522	2.9576	2.9629	2.9903	2.9959	3.0241	3.0241	3.0299	3.0127	2.9959	2.9848	2.9738
util living area	0.9473	0.9117	0.8560	0.7619	0.6335	0.4821	0.3600	0.3973	0.5896	0.8069	0.9193	0.9552 (86)
Living	19.3870	19.6707	20.0249	20.4065	20.6771	20.8289	20.8769	20.8694	20.7663	20.3956	19.8215	19.3329
Non living	18.3978	18.7559	19.1996	19.6742	19.9959	20.1722	20.2195	20.2150	20.1056	19.6710	18.9566	18.3343
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	4	0	0	0	0	0	0	0	0	0	0	0
16 / 9	27	0	0	0	0	0	0	0	0	0	0	30
MIT	20.2043	19.6707	20.0249	20.4065	20.6771	20.8289	20.8769	20.8694	20.7663	20.3956	19.8215	20.0325 (87)
Th 2	20.3438	20.3455	20.3472	20.3556	20.3573	20.3658	20.3658	20.3674	20.3624	20.3573	20.3539	20.3506 (88)
util rest of house	0.9422	0.9037	0.8432	0.7414	0.6033	0.4415	0.3115	0.3473	0.5488	0.7853	0.9106	0.9508 (89)
MIT 2	19.5957	18.7559	19.1996	19.6742	19.9959	20.1722	20.2195	20.2150	20.1056	19.6710	18.9566	19.4243 (90)
Living area fraction	fLA = Living area / (4) =											0.4014 (91)
MIT	19.8400	19.1231	19.5308	19.9681	20.2693	20.4358	20.4834	20.4776	20.3708	19.9618	19.3037	19.6684 (92)
Temperature adjustment												0.0000
adjusted MIT	19.8400	19.1231	19.5308	19.9681	20.2693	20.4358	20.4834	20.4776	20.3708	19.9618	19.3037	19.6684 (93)

8. Space heating requirement

Utilisation	0.9378	0.8860	0.8252	0.7282	0.5990	0.4461	0.3206	0.3561	0.5494	0.7707	0.8937	0.9456 (94)
Useful gains	1277.4824	1464.7522	1566.0248	1535.1452	1336.5048	974.2511	671.9160	698.0303	1002.4188	1224.5838	1217.0602	1205.3065 (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	2854.6404	2605.5892	2380.6335	1994.2769	1539.7290	1033.9233	688.0159	720.3825	1117.2906	1682.1302	2205.0224	2810.4278 (97)
Space heating kWh	1173.4055	766.6425	606.0689	330.5748	151.1988	0.0000	0.0000	0.0000	0.0000	340.4146	711.3328	1194.2103 (98a)
Space heating requirement - total per year (kWh/year)												5273.8481
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	1173.4055	766.6425	606.0689	330.5748	151.1988	0.0000	0.0000	0.0000	0.0000	340.4146	711.3328	1194.2103 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												5273.8481

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Space heating per m2

(98c) / (4) = 19.9994 (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 %)													419.3694 (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	1173.4055	766.6425	606.0689	330.5748	151.1988	0.0000	0.0000	0.0000	0.0000	340.4146	711.3328	1194.2103	(98)
Space heating efficiency (main heating system 1)	419.3694	419.3694	419.3694	419.3694	419.3694	0.0000	0.0000	0.0000	0.0000	419.3694	419.3694	419.3694	(210)
Space heating fuel (main heating system)	279.8024	182.8084	144.5191	78.8266	36.0539	0.0000	0.0000	0.0000	0.0000	81.1730	169.6196	284.7633	(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	258.6610	228.5128	242.4157	212.5886	205.6439	184.8574	182.2365	189.7977	192.2164	214.8484	229.0371	255.7885	(64)
Efficiency of water heater (217)m	199.4354	199.4354	199.4354	199.4354	199.4354	199.4354	199.4354	199.4354	199.4354	199.4354	199.4354	199.4354	(216)
Fuel for water heating, kWh/month	129.6966	114.5798	121.5510	106.5952	103.1130	92.6904	91.3762	95.1675	96.3803	107.7283	114.8427	128.2563	(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	62.0176	56.0159	62.0176	60.0170	62.0176	60.0170	62.0176	62.0176	60.0170	62.0176	60.0170	62.0176	(231)
Lighting	44.4546	35.6631	32.1107	23.5256	18.1719	14.8466	16.5770	21.5474	27.9880	36.7217	41.4771	45.6901	(232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-80.6263	-116.5946	-171.4597	-194.4918	-209.5868	-191.9853	-189.7112	-177.7403	-155.9017	-132.3965	-88.8795	-69.2890	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity) (233b)m	-32.0683	-71.4603	-148.8194	-234.7453	-320.6995	-329.3705	-324.7547	-271.7512	-196.1402	-108.0068	-44.7926	-25.0172	(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													1257.5662 (211)
Space heating fuel - main system 2													0.0000 (213)
Space heating fuel - secondary													0.0000 (215)
Efficiency of water heater													199.4354
Water heating fuel used													1301.9774 (219)
Space cooling fuel													0.0000 (221)
Electricity for pumps and fans: (BalancedWithHeatRecovery, Database: in-use factor = 1.1000, SFP = 0.8360)													730.2070 (230a)
mechanical ventilation fans (SFP = 0.8360)													730.2070 (231)
Total electricity for the above, kWh/year													358.7737 (232)
Electricity for lighting (calculated in Appendix L)													
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation													-3886.2886 (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													-237.7643 (238)

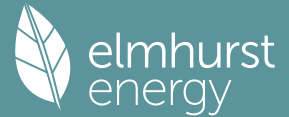
10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1257.5662	16.4900	207.3727	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1301.9774	16.4900	214.6961	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	730.2070	16.4900	120.4111	(249)
Energy for lighting	358.7737	16.4900	59.1618	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1778.6628	16.4900	-293.3015	
PV Unit electricity exported	-2107.6259	5.5900	-117.8163	
Total			-411.1178	(252)
Total energy cost			190.5239	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)		0.2222 (257)
SAP value	[(255) x (256)] / [(4) + 45.0] =	96.3984
SAP rating (Section 12)		96 (258)
SAP band		A

Full SAP Calculation Printout



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	1257.5662	0.1559	196.0684 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1301.9774	0.1409	183.5055 (264)
Space and water heating			379.5739 (265)
Pumps, fans and electric keep-hot	730.2070	0.1387	101.2887 (267)
Energy for lighting	358.7737	0.1443	51.7821 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1778.6628	0.1345	-239.2523
PV Unit electricity exported	-2107.6259	0.1244	-262.2347
Total			-501.4870 (269)
Total CO2, kg/year			31.1577 (272)
CO2 emissions per m2			0.1200 (273)
EI value			99.8648
EI rating			100 (274)
EI band			A

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	135.3200 (1b)	x 2.5300 (2b)	= 342.3596 (1b) - (3b)
First floor	128.3800 (1c)	x 2.9100 (2c)	= 373.5858 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	263.7000		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 715.9454 (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)

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		2.0000 (17)
Infiltration rate		0.1000 (18)
Number of sides sheltered		2 (19)

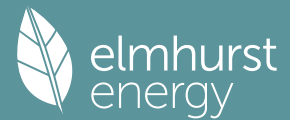
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.0850 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.8000	5.5000	5.5000	5.0000	4.9000	4.3000	4.4000	4.2000	4.5000	5.1000	5.2000	5.7000 (22)
Wind factor	1.4500	1.3750	1.3750	1.2500	1.2250	1.0750	1.1000	1.0500	1.1250	1.2750	1.3000	1.4250 (22a)
Adj infilt rate	0.1232	0.1169	0.1169	0.1063	0.1041	0.0914	0.0935	0.0893	0.0956	0.1084	0.1105	0.1211 (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) =												81.0000 (23c)
Effective ac	0.2182	0.2119	0.2119	0.2012	0.1991	0.1864	0.1885	0.1842	0.1906	0.2034	0.2055	0.2161 (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
Window (Uw = 1.20)			38.2400	1.1450	43.7863		(27)
Door			5.8800	1.2000	7.0560		(26a)
Floor 1 P/a 0.38			135.3200	0.1200	16.2384	75.0000	10149.0000 (28a)
External Wall 1 Render	89.0400	29.2800	59.7600	0.1700	10.1592	9.0000	537.8400 (29a)
External Wall 2 Clad	117.6500	12.7400	104.9100	0.1700	17.8347	9.0000	944.1900 (29a)
External Wall 3 Stone	53.7600	2.1000	51.6600	0.1700	8.7822	9.0000	464.9400 (29a)
External Roof 1 Horz	87.8200		87.8200	0.1000	8.7820	9.0000	790.3800 (30)
External Roof 2 sloping	57.9900		57.9900	0.1300	7.5387	9.0000	521.9100 (30)
Total net area of external elements Aum(A, m2)			541.5800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	120.1775		(33)
Internal Wall 1 GF			91.2000			9.0000	820.8000 (32c)
Internal Wall 2 FF			185.5400			9.0000	1669.8600 (32c)
Internal Floor 1			128.3800			18.0000	2310.8400 (32d)
Internal Ceiling 1			128.3800			9.0000	1155.4200 (32e)

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Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 19365.1800 (34)
 Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 73.4364 (35)

List of Thermal Bridges	K1 Element	Length	Psi-value	Total
E16 Corner (normal)		30.0000	0.0300	0.9000
E5 Ground floor (normal)		51.3000	0.0210	1.0773
E10 Eaves (insulation at ceiling level)		30.5000	0.0440	1.3420
E6 Intermediate floor within a dwelling		51.3000	0.0800	4.1040
E11 Eaves (insulation at rafter level)		16.0500	0.0390	0.6260
E13 Gable (insulation at rafter level)		5.8000	0.0240	0.1392
R4 Ridge (vaulted ceiling)		7.6300	0.1200	0.9156
E17 Corner (inverted - internal area greater than external area)		10.0000	-0.0150	-0.1500
E2 Other lintels (including other steel lintels)		34.9000	0.0840	2.9316
E3 Sill		32.1000	0.0430	1.3803
E4 Jamb		64.8000	0.0340	2.2032

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 15.4691 (36)
 Point Thermal bridges 0.0000
 Total fabric heat loss (33) + (36) + (36a) = 135.6466 (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	51.5642	50.0580	50.0580	47.5477	47.0457	44.0333	44.5354	43.5313	45.0374	48.0498	48.5518	51.0621 (38)
Average = Sum(39)m / 12 =	187.2108	185.7046	185.7046	183.1943	182.6923	179.6799	180.1820	179.1779	180.6840	183.6964	184.1984	186.7087 (39)
												183.2362

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.7099	0.7042	0.7042	0.6947	0.6928	0.6814	0.6833	0.6795	0.6852	0.6966	0.6985	0.7080 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy 3.0847 (42)

Hot water usage for mixer showers	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Hot water usage for baths	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42a)
Hot water usage for other uses	87.6146	86.3134	84.4810	81.1025	78.5727	75.7675	74.2523	76.0718	78.0530	81.0546	84.5027	87.3184 (42b)
Average daily hot water use (litres/day)	46.2208	44.5401	42.8593	41.1786	39.4978	37.8170	37.8170	39.4978	41.1786	42.8593	44.5401	46.2208 (42c)
												123.2515 (43)

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	133.8354	130.8534	127.3403	122.2810	118.0705	113.5845	112.0693	115.5696	119.2315	123.9139	129.0428	133.5392 (44)
Energy content (annual)	211.9626	186.3336	195.7173	167.3966	158.9455	139.6654	135.5381	143.0993	147.0244	168.1500	183.8451	209.0901 (45)
Distribution loss (46)m = 0.15 x (45)m	31.7944	27.9500	29.3576	25.1095	23.8418	20.9498	20.3307	21.4649	22.0537	25.2225	27.5768	31.3635 (46)

Water storage loss:
 Store volume 250.0000 (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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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	23.4360	21.1680	23.4360	22.6800	23.4360	22.6800	23.4360	23.4360	22.6800	23.4360	22.6800	23.4360 (57)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	258.6610	228.5128	242.4157	212.5886	205.6439	184.8574	182.2365	189.7977	192.2164	214.8484	229.0371	255.7885 (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	258.6610	228.5128	242.4157	212.5886	205.6439	184.8574	182.2365	189.7977	192.2164	214.8484	229.0371	255.7885 (64)
												Total per year (kWh/year) = Sum(64)m = 2596.6042 (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
 107.8363 95.6993 102.4347 91.8130 90.2081 82.5924 82.4252 84.9393 85.0392 93.2686 97.2821 106.8812 (65)

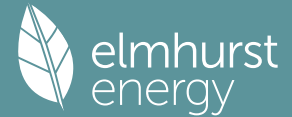
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	185.0844	185.0844	185.0844	185.0844	185.0844	185.0844	185.0844	185.0844	185.0844	185.0844	185.0844	185.0844 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	50.7881	45.1096	36.6856	27.7733	20.7609	17.5272	18.9388	24.6173	33.0413	41.9536	48.9660	52.1997 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	639.0423	645.6736	628.9630	593.3882	548.4814	506.2753	478.0791	471.4478	488.1584	523.7332	568.6400	610.8461 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	56.5932	56.5932	56.5932	56.5932	56.5932	56.5932	56.5932	56.5932	56.5932	56.5932	56.5932	56.5932 (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)	-123.3896	-123.3896	-123.3896	-123.3896	-123.3896	-123.3896	-123.3896	-123.3896	-123.3896	-123.3896	-123.3896	-123.3896 (71)
Water heating gains (Table 5)	144.9412	142.4096	137.6811	127.5180	121.2475	114.7116	110.7865	114.1657	118.1100	125.3610	135.1140	143.6575 (72)
Total internal gains	953.0597	951.4807	921.6177	866.9675	808.7777	756.8022	726.0924	728.5188	757.5978	809.3358	871.0080	924.9913 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b g	Specific data or Table 6c FF	Access factor Table 6d	Gains W
North	12.9700	14.1962	0.7600	0.7000	0.7700	67.8825 (74)

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East	4.2600	26.5726	0.7600	0.7000	0.7700	41.7339 (76)
South	17.5400	59.2009	0.7600	0.7000	0.7700	382.8271 (78)
West	3.4700	26.5726	0.7600	0.7000	0.7700	33.9945 (80)

Solar gains	526.4380	751.1070	1025.0918	1340.9652	1449.2870	1565.6564	1344.9612	1317.4226	1161.6929	839.4760	594.7016	464.0581 (83)
Total gains	1479.4977	1702.5878	1946.7095	2207.9328	2258.0647	2322.4585	2071.0536	2045.9414	1919.2907	1648.8118	1465.7097	1389.0494 (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	28.7335	28.9665	28.9665	29.3634	29.4441	29.9378	29.8544	30.0217	29.7714	29.2832	29.2034	28.8107
alpha	2.9156	2.9311	2.9311	2.9576	2.9629	2.9959	2.9903	3.0014	2.9848	2.9522	2.9469	2.9207
util living area	0.9270	0.8969	0.8416	0.7518	0.6470	0.4983	0.4354	0.4381	0.5851	0.7788	0.8899	0.9335 (86)
Living	19.5884	19.7838	20.0821	20.4076	20.6473	20.8115	20.8518	20.8520	20.7606	20.4578	20.0024	19.5781
Non living	18.6444	18.8922	19.2627	19.6660	19.9523	20.1450	20.1861	20.1898	20.0906	19.7346	19.1744	18.6337
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	5	0	0	0	0	0	0	0	0	0	0	0
16 / 9	26	4	0	0	0	0	0	0	0	0	0	31
MIT	20.3295	19.8591	20.0821	20.4076	20.6473	20.8115	20.8518	20.8520	20.7606	20.4578	20.0024	20.1947 (87)
Th 2	20.3321	20.3371	20.3371	20.3455	20.3472	20.3573	20.3556	20.3590	20.3539	20.3438	20.3421	20.3337 (88)
util rest of house	0.9197	0.8872	0.8274	0.7310	0.6176	0.4602	0.3884	0.3912	0.5451	0.7539	0.8777	0.9267 (89)
MIT 2	19.7073	19.0075	19.2627	19.6660	19.9523	20.1450	20.1861	20.1898	20.0906	19.7346	19.1744	19.5834 (90)
Living area fraction									fLA = Living area / (4) =			0.4014 (91)
MIT	19.9570	19.3493	19.5916	19.9637	20.2313	20.4125	20.4533	20.4556	20.3595	20.0249	19.5067	19.8287 (92)
Temperature adjustment												0.0000
adjusted MIT	19.9570	19.3493	19.5916	19.9637	20.2313	20.4125	20.4533	20.4556	20.3595	20.0249	19.5067	19.8287 (93)

8. Space heating requirement

Utilisation	0.9152	0.8707	0.8094	0.7180	0.6122	0.4635	0.3957	0.3984	0.5455	0.7406	0.8597	0.9209 (94)
Useful gains	1354.0896	1482.4166	1575.7059	1585.3496	1382.2894	1076.5028	819.5445	815.1151	1046.9275	1221.1302	1260.1389	1279.1371 (95)
Ext temp.	5.4000	5.7000	7.0000	8.8000	11.4000	14.0000	15.7000	15.7000	13.9000	11.2000	8.2000	5.7000 (96)
Heat loss rate W	2725.2317	2534.7420	2338.3201	2045.1192	1613.4070	1152.2013	856.4612	852.1013	1167.1253	1621.1005	2082.6827	2637.9574 (97)
Space heating kWh	1020.1298	707.1627	567.3850	331.0341	171.9515	0.0000	0.0000	0.0000	0.0000	297.5779	592.2316	1010.9623 (98a)
Space heating requirement - total per year (kWh/year)												4698.4349
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	1020.1298	707.1627	567.3850	331.0341	171.9515	0.0000	0.0000	0.0000	0.0000	297.5779	592.2316	1010.9623 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4698.4349
Space heating per m2										(98c) / (4) =		17.8173 (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 %)												421.5949 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement	1020.1298	707.1627	567.3850	331.0341	171.9515	0.0000	0.0000	0.0000	0.0000	297.5779	592.2316	1010.9623 (98)
Space heating efficiency (main heating system 1)	421.5949	421.5949	421.5949	421.5949	421.5949	0.0000	0.0000	0.0000	0.0000	421.5949	421.5949	421.5949 (210)
Space heating fuel (main heating system)	241.9692	167.7351	134.5806	78.5195	40.7860	0.0000	0.0000	0.0000	0.0000	70.5839	140.4741	239.7947 (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	258.6610	228.5128	242.4157	212.5886	205.6439	184.8574	182.2365	189.7977	192.2164	214.8484	229.0371	255.7885 (64)
Efficiency of water heater (217)m	199.4241	199.4241	199.4241	199.4241	199.4241	199.4241	199.4241	199.4241	199.4241	199.4241	199.4241	199.4241 (216)
Fuel for water heating, kWh/month	129.7040	114.5864	121.5579	106.6013	103.1189	92.6957	91.3814	95.1729	96.3858	107.7345	114.8493	128.2636 (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	62.0176	56.0159	62.0176	60.0170	62.0176	60.0170	62.0176	62.0176	60.0170	62.0176	60.0170	62.0176 (231)
Lighting	44.4546	35.6631	32.1107	23.5256	18.1719	14.8466	16.5770	21.5474	27.9880	36.7217	41.4771	45.6901 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-100.5559	-124.7327	-179.5116	-205.4673	-213.4062	-201.2170	-188.7018	-185.3094	-165.7401	-141.2688	-104.6089	-88.8703 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-48.5543	-82.3176	-165.3122	-266.0984	-331.8642	-374.1446	-320.2066	-302.0162	-226.0362	-124.8385	-61.9772	-39.7798 (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												

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Space heating fuel - main system 1	1114.4431 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	199.4241
Water heating fuel used	1302.0517 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans: (BalancedWithHeatRecovery, Database: in-use factor = 1.1000, SFP = 0.8360)	
mechanical ventilation fans (SFP = 0.8360)	730.2070 (230a)
Total electricity for the above, kWh/year	730.2070 (231)
Electricity for lighting (calculated in Appendix L)	358.7737 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-4242.5357 (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	-737.0602 (238)

10a. Fuel costs - using BEDF prices (538)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1114.4431	25.1600	280.3939 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1302.0517	25.1600	327.5962 (247)
Energy for instantaneous electric shower(s)	0.0000	25.1600	0.0000 (247a)
Pumps, fans and electric keep-hot	730.2070	25.1600	183.7201 (249)
Energy for lighting	358.7737	25.1600	90.2675 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1899.3900	25.1600	-477.8865
PV Unit electricity exported	-2343.1457	5.8100	-136.1368
Total			-614.0233 (252)
Total energy cost			267.9543 (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	1114.4431	0.1556	173.3790 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1302.0517	0.1409	183.5160 (264)
Space and water heating			356.8950 (265)
Pumps, fans and electric keep-hot	730.2070	0.1387	101.2887 (267)
Energy for lighting	358.7737	0.1443	51.7821 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1899.3900	0.1353	-256.9258
PV Unit electricity exported	-2343.1457	0.1260	-295.2184
Total			-552.1442 (269)
Total CO2, kg/year			-42.1784 (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	1114.4431	1.5759	1756.2902 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1302.0517	1.5212	1980.6298 (278)
Space and water heating			3736.9200 (279)
Pumps, fans and electric keep-hot	730.2070	1.5128	1104.6572 (281)
Energy for lighting	358.7737	1.5338	550.2991 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1899.3900	1.4999	-2848.9837
PV Unit electricity exported	-2343.1457	0.4625	-1083.6752
Total			-3932.6589 (283)
Total Primary energy kWh/year			1459.2174 (286)

SAP 10 EPC IMPROVEMENTS

SEC1 ASHP Recog Const Details

Current energy efficiency rating: A 96
Current environmental impact rating: A 100

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

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

Measures omitted - SAP change or cost saving too small:
N Solar water heating + 0.7 -£ 66 -37 kg (87.6%)

Typical annual savings Energy Environmental efficiency impact

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Recommended measures
(none)

Total Savings £0 0.00 kg/m²

Potential energy efficiency rating: A 96
 Potential environmental impact rating: A 100

Fuel prices for cost data on this page from database revision number 538 TEST (29 Feb 2024)
 Recommendation texts revision number 6.1 (11 Jun 2019)

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

	Current £882	Potential £882	£0
Electricity			
Space heating	£464	£464	£0
Water heating	£328	£328	£0
Lighting	£90	£90	£0
Generated (PV)	-£614	-£614	£0
Total cost of fuels	£268	£268	£0
Total cost of uses	£268	£268	£0
Delivered energy	-3 kWh/m ²	-3 kWh/m ²	0 kWh/m ²
Carbon dioxide emissions	-0.0 tonnes	-0.0 tonnes	0.0 tonnes
CO2 emissions per m ²	-0 kg/m ²	-0 kg/m ²	0 kg/m ²
Primary energy	6 kWh/m ²	6 kWh/m ²	0 kWh/m ²

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	135.3200 (1b)	x 2.5300 (2b)	= 342.3596 (1b) - (3b)
First floor	128.3800 (1c)	x 2.9100 (2c)	= 373.5858 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	263.7000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 715.9454 (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		2.0000 (17)
Infiltration rate		0.1000 (18)
Number of sides sheltered		2 (19)

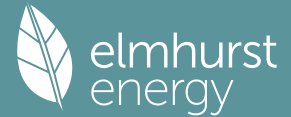
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.0850 (21)

	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	0.1084	0.1063	0.1041	0.0935	0.0914	0.0808	0.0808	0.0786	0.0850	0.0914	0.0956	0.0999 (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) =												81.0000 (23c)
Effective ac	0.2034	0.2012	0.1991	0.1885	0.1864	0.1757	0.1757	0.1736	0.1800	0.1864	0.1906	0.1949 (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
Window (Uw = 1.20)			38.2400	1.1450	43.7863		(27)
Door			5.8800	1.2000	7.0560		(26a)
Floor 1 P/a 0.38			135.3200	0.1200	16.2384	75.0000	10149.0000 (28a)
External Wall 1 Render	89.0400	29.2800	59.7600	0.1700	10.1592	9.0000	537.8400 (29a)
External Wall 2 Clad	117.6500	12.7400	104.9100	0.1700	17.8347	9.0000	944.1900 (29a)
External Wall 3 Stone	53.7600	2.1000	51.6600	0.1700	8.7822	9.0000	464.9400 (29a)
External Roof 1 Horz	87.8200		87.8200	0.1000	8.7820	9.0000	790.3800 (30)
External Roof 2 sloping	57.9900		57.9900	0.1300	7.5387	9.0000	521.9100 (30)
Total net area of external elements Aum(A, m ²)			541.5800				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	120.1775	(33)
Internal Wall 1 GF			91.2000			9.0000	820.8000 (32c)

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Internal Wall 2 FF	185.5400	9.0000	1669.8600 (32c)
Internal Floor 1	128.3800	18.0000	2310.8400 (32d)
Internal Ceiling 1	128.3800	9.0000	1155.4200 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 19365.1800 (34)
 Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 73.4364 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E16 Corner (normal)	30.0000	0.0300	0.9000
E5 Ground floor (normal)	51.3000	0.0210	1.0773
E10 Eaves (insulation at ceiling level)	30.5000	0.0440	1.3420
E6 Intermediate floor within a dwelling	51.3000	0.0800	4.1040
E11 Eaves (insulation at rafter level)	16.0500	0.0390	0.6260
E13 Gable (insulation at rafter level)	5.8000	0.0240	0.1392
R4 Ridge (vaulted ceiling)	7.6300	0.1200	0.9156
E17 Corner (inverted - internal area greater than external area)	10.0000	-0.0150	-0.1500
E2 Other lintels (including other steel lintels)	34.9000	0.0840	2.9316
E3 Sill	32.1000	0.0430	1.3803
E4 Jamb	64.8000	0.0340	2.2032

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 15.4691 (36)
 Point Thermal bridges (36a) = 0.0000
 Total fabric heat loss (33) + (36) + (36a) = 135.6466 (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	48.0498	47.5477	47.0457	44.5354	44.0333	41.5230	41.5230	41.0210	42.5272	44.0333	45.0374	46.0416 (38)
Average = Sum(39)m / 12 =	183.6964	183.1943	182.6923	180.1820	179.6799	177.1697	177.1697	176.6676	178.1738	179.6799	180.6840	181.6882 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.6966	0.6947	0.6928	0.6833	0.6814	0.6719	0.6719	0.6700	0.6757	0.6814	0.6852	0.6890 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy 3.0847 (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 87.6146 86.3134 84.4810 81.1025 78.5727 75.7675 74.2523 76.0718 78.0530 81.0546 84.5027 87.3184 (42b)

Hot water usage for other uses 46.2208 44.5401 42.8593 41.1786 39.4978 37.8170 37.8170 39.4978 41.1786 42.8593 44.5401 46.2208 (42c)

Average daily hot water use (litres/day) 123.2515 (43)

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	133.8354	130.8534	127.3403	122.2810	118.0705	113.5845	112.0693	115.5696	119.2315	123.9139	129.0428	133.5392 (44)
Energy content (annual)	211.9626	186.3336	195.7173	167.3966	158.9455	139.6654	135.5381	143.0993	147.0244	168.1500	183.8451	209.0901 (45)
Distribution loss (46)m = 0.15 x (45)m	31.7944	27.9500	29.3576	25.1095	23.8418	20.9498	20.3307	21.4649	22.0537	25.2225	27.5768	31.3635 (46)
Water storage loss:												
Store volume												250.0000 (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	258.6610	228.5128	242.4157	212.5886	205.6439	184.8574	182.2365	189.7977	192.2164	214.8484	229.0371	255.7885 (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	258.6610	228.5128	242.4157	212.5886	205.6439	184.8574	182.2365	189.7977	192.2164	214.8484	229.0371	255.7885 (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	107.8363	95.6993	102.4347	91.8130	90.2081	82.5924	82.4252	84.9393	85.0392	93.2686	97.2821	106.8812 (65)

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

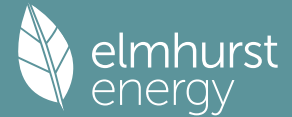
Metabolic gains (Table 5), Watts

(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	50.7881	45.1096	36.6856	27.7733	20.7609	17.5272	18.9388	24.6173	33.0413	41.9536	48.9660	52.1997 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	639.0423	645.6736	628.9630	593.3882	548.4814	506.2753	478.0791	471.4478	488.1584	523.7332	568.6400	610.8461 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	56.5932	56.5932	56.5932	56.5932	56.5932	56.5932	56.5932	56.5932	56.5932	56.5932	56.5932	56.5932 (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)	-123.3896	-123.3896	-123.3896	-123.3896	-123.3896	-123.3896	-123.3896	-123.3896	-123.3896	-123.3896	-123.3896	-123.3896 (71)
Water heating gains (Table 5)	144.9412	142.4096	137.6811	127.5180	121.2475	114.7116	110.7865	114.1657	118.1100	125.3610	135.1140	143.6575 (72)
Total internal gains	953.0597	951.4807	921.6177	866.9675	808.7777	756.8022	726.0924	728.5188	757.5978	809.3358	871.0080	924.9913 (73)

6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains
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	m2		Table 6a W/m2		Specific data or Table 6b		Specific data or Table 6c		factor Table 6d		W
North	12.9700		10.6334		0.7600		0.7000		0.7700		50.8460 (74)
East	4.2600		19.6403		0.7600		0.7000		0.7700		30.8462 (76)
South	17.5400		46.7521		0.7600		0.7000		0.7700		302.3258 (78)
West	3.4700		19.6403		0.7600		0.7000		0.7700		25.1259 (80)

Solar gains	409.1439	701.7944	976.1443	1241.0411	1422.3919	1427.2645	1369.6576	1231.4219	1067.0916	779.6365	490.8749	349.6538 (83)
Total gains	1362.2036	1653.2752	1897.7620	2108.0087	2231.1696	2184.0667	2095.7500	1959.9407	1824.6894	1588.9723	1361.8830	1274.6451 (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	29.2832	29.3634	29.4441	29.8544	29.9378	30.3620	30.3620	30.4482	30.1908	29.9378	29.7714	29.6069
alpha	2.9522	2.9576	2.9629	2.9903	2.9959	3.0241	3.0241	3.0299	3.0127	2.9959	2.9848	2.9738
util living area	0.9473	0.9117	0.8560	0.7619	0.6335	0.4821	0.3600	0.3973	0.5896	0.8069	0.9193	0.9552 (86)
Living	19.3870	19.6707	20.0249	20.4065	20.6771	20.8289	20.8769	20.8694	20.7663	20.3956	19.8215	19.3329
Non living	18.3978	18.7559	19.1996	19.6742	19.9959	20.1722	20.2195	20.2150	20.1056	19.6710	18.9566	18.3343
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	4	0	0	0	0	0	0	0	0	0	0	0
16 / 9	27	0	0	0	0	0	0	0	0	0	0	30
MIT	20.2043	19.6707	20.0249	20.4065	20.6771	20.8289	20.8769	20.8694	20.7663	20.3956	19.8215	20.0325 (87)
Th 2	20.3438	20.3455	20.3472	20.3556	20.3573	20.3658	20.3658	20.3674	20.3624	20.3573	20.3539	20.3506 (88)
util rest of house	0.9422	0.9037	0.8432	0.7414	0.6033	0.4415	0.3115	0.3473	0.5488	0.7853	0.9106	0.9508 (89)
MIT 2	19.5957	18.7559	19.1996	19.6742	19.9959	20.1722	20.2195	20.2150	20.1056	19.6710	18.9566	19.4243 (90)
Living area fraction										FLA = Living area / (4) =		0.4014 (91)
MIT	19.8400	19.1231	19.5308	19.9681	20.2693	20.4358	20.4834	20.4776	20.3708	19.9618	19.3037	19.6684 (92)
Temperature adjustment												0.0000
adjusted MIT	19.8400	19.1231	19.5308	19.9681	20.2693	20.4358	20.4834	20.4776	20.3708	19.9618	19.3037	19.6684 (93)

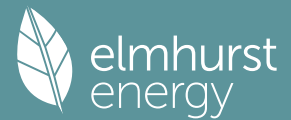
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9378	0.8860	0.8252	0.7282	0.5990	0.4461	0.3206	0.3561	0.5494	0.7707	0.8937	0.9456 (94)
Useful gains	1277.4824	1464.7522	1566.0248	1535.1452	1336.5048	974.2511	671.9160	698.0303	1002.4188	1224.5838	1217.0602	1205.3065 (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	2854.6404	2605.5892	2380.6335	1994.2769	1539.7290	1033.9233	688.0159	720.3825	1117.2906	1682.1302	2205.0224	2810.4278 (97)
Space heating kWh	1173.4055	766.6425	606.0689	330.5748	151.1988	0.0000	0.0000	0.0000	0.0000	340.4146	711.3328	1194.2103 (98a)
Space heating requirement - total per year (kWh/year)												5273.8481
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	1173.4055	766.6425	606.0689	330.5748	151.1988	0.0000	0.0000	0.0000	0.0000	340.4146	711.3328	1194.2103 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												5273.8481
Space heating per m2										(98c) / (4) =		19.9994 (99)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												419.3694 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement	1173.4055	766.6425	606.0689	330.5748	151.1988	0.0000	0.0000	0.0000	0.0000	340.4146	711.3328	1194.2103 (98)
Space heating efficiency (main heating system 1)	419.3694	419.3694	419.3694	419.3694	419.3694	0.0000	0.0000	0.0000	0.0000	419.3694	419.3694	419.3694 (210)
Space heating fuel (main heating system)	279.8024	182.8084	144.5191	78.8266	36.0539	0.0000	0.0000	0.0000	0.0000	81.1730	169.6196	284.7633 (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	258.6610	228.5128	242.4157	212.5886	205.6439	184.8574	182.2365	189.7977	192.2164	214.8484	229.0371	255.7885 (64)
Efficiency of water heater (217)m	199.4354	199.4354	199.4354	199.4354	199.4354	199.4354	199.4354	199.4354	199.4354	199.4354	199.4354	199.4354 (216)
Fuel for water heating, kWh/month	129.6966	114.5798	121.5510	106.5952	103.1130	92.6904	91.3762	95.1675	96.3803	107.7283	114.8427	128.2563 (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	62.0176	56.0159	62.0176	60.0170	62.0176	60.0170	62.0176	62.0176	60.0170	62.0176	60.0170	62.0176 (231)
Lighting	44.4546	35.6631	32.1107	23.5256	18.1719	14.8466	16.5770	21.5474	27.9880	36.7217	41.4771	45.6901 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-80.6263	-116.5946	-171.4597	-194.4918	-209.5868	-191.9853	-189.7112	-177.7403	-155.9017	-132.3965	-88.8795	-69.2890 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity) (233b)m	-32.0683	-71.4603	-148.8194	-234.7453	-320.6995	-329.3705	-324.7547	-271.7512	-196.1402	-108.0068	-44.7926	-25.0172 (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)												

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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												1257.5662	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												199.4354	
Water heating fuel used												1301.9774	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans: (BalancedWithHeatRecovery, Database: in-use factor = 1.1000, SFP = 0.8360)													
mechanical ventilation fans (SFP = 0.8360)												730.2070	(230a)
Total electricity for the above, kWh/year												730.2070	(231)
Electricity for lighting (calculated in Appendix L)												358.7737	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-3886.2886	(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												-237.7643	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1257.5662	16.4900	207.3727	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1301.9774	16.4900	214.6961	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	730.2070	16.4900	120.4111	(249)
Energy for lighting	358.7737	16.4900	59.1618	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1778.6628	16.4900	-293.3015	
PV Unit electricity exported	-2107.6259	5.5900	-117.8163	
Total			-411.1178	(252)
Total energy cost			190.5239	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	0.2222	(257)
SAP value		96.3984	
SAP rating (Section 12)		96	(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	1257.5662	0.1559	196.0684	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1301.9774	0.1409	183.5055	(264)
Space and water heating			379.5739	(265)
Pumps, fans and electric keep-hot	730.2070	0.1387	101.2887	(267)
Energy for lighting	358.7737	0.1443	51.7821	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1778.6628	0.1345	-239.2523	
PV Unit electricity exported	-2107.6259	0.1244	-262.2347	
Total			-501.4870	(269)
Total CO2, kg/year			31.1577	(272)
CO2 emissions per m2			0.1200	(273)
EI value			99.8648	
EI rating			100	(274)
EI band			A	

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)	
Ground floor	135.3200 (1b)	x 2.5300 (2b)	= 342.3596 (1b) - (3b)	
First floor	128.3800 (1c)	x 2.9100 (2c)	= 373.5858 (1c) - (3c)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	263.7000		(4)	
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	715.9454 (5)	

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2. Ventilation rate

												m3 per hour	
Number of open chimneys												0 * 80 =	0.0000 (6a)
Number of open flues												0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire												0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler												0 * 20 =	0.0000 (6d)
Number of flues attached to other heater												0 * 35 =	0.0000 (6e)
Number of blocked chimneys												0 * 20 =	0.0000 (6f)
Number of intermittent extract fans												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												2.0000 (17)	
Infiltration rate												0.1000 (18)	
Number of sides sheltered												2 (19)	
												(20) = 1 - [0.075 x (19)] =	
Shelter factor												0.8500 (20)	
Infiltration rate adjusted to include shelter factor												(21) = (18) x (20) =	
												0.0850 (21)	
												(22)	
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	5.8000	5.5000	5.5000	5.0000	4.9000	4.3000	4.4000	4.2000	4.5000	5.1000	5.2000	5.7000	(22)
Wind factor	1.4500	1.3750	1.3750	1.2500	1.2250	1.0750	1.1000	1.0500	1.1250	1.2750	1.3000	1.4250	(22a)
Adj infilt rate	0.1232	0.1169	0.1169	0.1063	0.1041	0.0914	0.0935	0.0893	0.0956	0.1084	0.1105	0.1211	(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) =													81.0000 (23c)
Effective ac	0.2182	0.2119	0.2119	0.2012	0.1991	0.1864	0.1885	0.1842	0.1906	0.2034	0.2055	0.2161	(25)

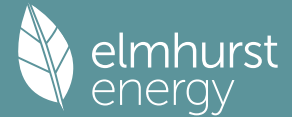
3. Heat losses and heat loss parameter

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						
Window (Uw = 1.20)			38.2400	1.1450	43.7863			(27)					
Door			5.8800	1.2000	7.0560			(26a)					
Floor 1 P/a 0.38			135.3200	0.1200	16.2384	75.0000	10149.0000	(28a)					
External Wall 1 Render	89.0400	29.2800	59.7600	0.1700	10.1592	9.0000	537.8400	(29a)					
External Wall 2 Clad	117.6500	12.7400	104.9100	0.1700	17.8347	9.0000	944.1900	(29a)					
External Wall 3 Stone	53.7600	2.1000	51.6600	0.1700	8.7822	9.0000	464.9400	(29a)					
External Roof 1 Horz	87.8200		87.8200	0.1000	8.7820	9.0000	790.3800	(30)					
External Roof 2 sloping	57.9900		57.9900	0.1300	7.5387	9.0000	521.9100	(30)					
Total net area of external elements Aum(A, m2)			541.5800					(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	120.1775		(33)					
Internal Wall 1 GF			91.2000			9.0000	820.8000	(32c)					
Internal Wall 2 FF			185.5400			9.0000	1669.8600	(32c)					
Internal Floor 1			128.3800			18.0000	2310.8400	(32d)					
Internal Ceiling 1			128.3800			9.0000	1155.4200	(32e)					
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) =	19365.1800 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								73.4364 (35)					
List of Thermal Bridges					Length	Psi-value	Total						
K1 Element					30.0000	0.0300	0.9000						
E16 Corner (normal)					51.3000	0.0210	1.0773						
E5 Ground floor (normal)					30.5000	0.0440	1.3420						
E10 Eaves (insulation at ceiling level)					51.3000	0.0800	4.1040						
E6 Intermediate floor within a dwelling					16.0500	0.0390	0.6260						
E11 Eaves (insulation at rafter level)					5.8000	0.0240	0.1392						
E13 Gable (insulation at rafter level)					7.6300	0.1200	0.9156						
R4 Ridge (vaulted ceiling)					10.0000	-0.0150	-0.1500						
E17 Corner (inverted - internal area greater than external area)					34.9000	0.0840	2.9316						
E2 Other lintels (including other steel lintels)					32.1000	0.0430	1.3803						
E3 Sill					64.8000	0.0340	2.2032						
E4 Jamb							15.4691 (36)						
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								0.0000 (36a)					
Point Thermal bridges								(33) + (36) + (36a) =					
Total fabric heat loss								135.6466 (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	
	51.5642	50.0580	50.0580	47.5477	47.0457	44.0333	44.5354	43.5313	45.0374	48.0498	48.5518	51.0621	(38)
Heat transfer coeff	187.2108	185.7046	185.7046	183.1943	182.6923	179.6799	180.1820	179.1779	180.6840	183.6964	184.1984	186.7087	(39)
Average = Sum(39)m / 12 =													183.2362
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.7099	0.7042	0.7042	0.6947	0.6928	0.6814	0.6833	0.6795	0.6852	0.6966	0.6985	0.7080	(40)
HLP (average)													0.6949
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													3.0847 (42)
Hot water usage for mixer showers													0.0000 (42a)
Hot water usage for baths	87.6146	86.3134	84.4810	81.1025	78.5727	75.7675	74.2523	76.0718	78.0530	81.0546	84.5027	87.3184	(42b)
Hot water usage for other uses	46.2208	44.5401	42.8593	41.1786	39.4978	37.8170	37.8170	39.4978	41.1786	42.8593	44.5401	46.2208	(42c)
Average daily hot water use (litres/day)													123.2515 (43)
Daily hot water use	133.8354	130.8534	127.3403	122.2810	118.0705	113.5845	112.0693	115.5696	119.2315	123.9139	129.0428	133.5392	(44)
Energy conte	211.9626	186.3336	195.7173	167.3966	158.9455	139.6654	135.5381	143.0993	147.0244	168.1500	183.8451	209.0901	(45)
Energy content (annual)													Total = Sum(45)m =
												2046.7682	

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Distribution loss (46)m = 0.15 x (45)m	31.7944	27.9500	29.3576	25.1095	23.8418	20.9498	20.3307	21.4649	22.0537	25.2225	27.5768	31.3635 (46)
Water storage loss:												
Store volume												250.0000 (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	258.6610	228.5128	242.4157	212.5886	205.6439	184.8574	182.2365	189.7977	192.2164	214.8484	229.0371	255.7885 (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	258.6610	228.5128	242.4157	212.5886	205.6439	184.8574	182.2365	189.7977	192.2164	214.8484	229.0371	255.7885 (64)
												Total per year (kWh/year) = Sum(64)m = 2596.6042 (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	107.8363	95.6993	102.4347	91.8130	90.2081	82.5924	82.4252	84.9393	85.0392	93.2686	97.2821	106.8812 (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	185.0844	185.0844	185.0844	185.0844	185.0844	185.0844	185.0844	185.0844	185.0844	185.0844	185.0844	185.0844 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	50.7881	45.1096	36.6856	27.7733	20.7609	17.5272	18.9388	24.6173	33.0413	41.9536	48.9660	52.1997 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	639.0423	645.6736	628.9630	593.3882	548.4814	506.2753	478.0791	471.4478	488.1584	523.7332	568.6400	610.8461 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	56.5932	56.5932	56.5932	56.5932	56.5932	56.5932	56.5932	56.5932	56.5932	56.5932	56.5932	56.5932 (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)	-123.3896	-123.3896	-123.3896	-123.3896	-123.3896	-123.3896	-123.3896	-123.3896	-123.3896	-123.3896	-123.3896	-123.3896 (71)
Water heating gains (Table 5)	144.9412	142.4096	137.6811	127.5180	121.2475	114.7116	110.7865	114.1657	118.1100	125.3610	135.1140	143.6575 (72)
Total internal gains	953.0597	951.4807	921.6177	866.9675	808.7777	756.8022	726.0924	728.5188	757.5978	809.3358	871.0080	924.9913 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W						
North	12.9700	14.1962	0.7600	0.7000	0.7700	67.8825 (74)						
East	4.2600	26.5726	0.7600	0.7000	0.7700	41.7339 (76)						
South	17.5400	59.2009	0.7600	0.7000	0.7700	382.8271 (78)						
West	3.4700	26.5726	0.7600	0.7000	0.7700	33.9945 (80)						
Solar gains	526.4380	751.1070	1025.0918	1340.9652	1449.2870	1565.6564	1344.9612	1317.4226	1161.6929	839.4760	594.7016	464.0581 (83)
Total gains	1479.4977	1702.5878	1946.7095	2207.9328	2258.0647	2322.4585	2071.0536	2045.9414	1919.2907	1648.8118	1465.7097	1389.0494 (84)

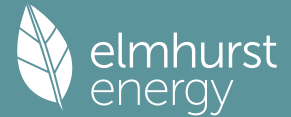
7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation factor for gains for living area, nil,m (see Table 9a)												21.0000 (85)
tau	28.7335	28.9665	28.9665	29.3634	29.4441	29.9378	29.8544	30.0217	29.7714	29.2832	29.2034	28.8107
alpha	2.9156	2.9311	2.9311	2.9576	2.9629	2.9959	2.9903	3.0014	2.9848	2.9522	2.9469	2.9207
util living area	0.9270	0.8969	0.8416	0.7518	0.6470	0.4983	0.4354	0.4381	0.5851	0.7788	0.8899	0.9335 (86)
Living	19.5884	19.7838	20.0821	20.4076	20.6473	20.8115	20.8518	20.8520	20.7606	20.4578	20.0024	19.5781
Non living	18.6444	18.8922	19.2627	19.6660	19.9523	20.1450	20.1861	20.1898	20.0906	19.7346	19.1744	18.6337
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	5	0	0	0	0	0	0	0	0	0	0	0
16 / 9	26	4	0	0	0	0	0	0	0	0	0	31
MIT	20.3295	19.8591	20.0821	20.4076	20.6473	20.8115	20.8518	20.8520	20.7606	20.4578	20.0024	20.1947 (87)
Th 2	20.3321	20.3371	20.3371	20.3455	20.3472	20.3573	20.3556	20.3590	20.3539	20.3438	20.3421	20.3337 (88)
util rest of house	0.9197	0.8872	0.8274	0.7310	0.6176	0.4602	0.3884	0.3912	0.5451	0.7539	0.8777	0.9267 (89)
MIT 2	19.7073	19.0075	19.2627	19.6660	19.9523	20.1450	20.1861	20.1898	20.0906	19.7346	19.1744	19.5834 (90)
Living area fraction									flA = Living area / (4) =			0.4014 (91)
MIT	19.9570	19.3493	19.5916	19.9637	20.2313	20.4125	20.4533	20.4556	20.3595	20.0249	19.5067	19.8287 (92)
Temperature adjustment												0.0000
adjusted MIT	19.9570	19.3493	19.5916	19.9637	20.2313	20.4125	20.4533	20.4556	20.3595	20.0249	19.5067	19.8287 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	1354.0896	1482.4166	1575.7059	1585.3496	1382.2894	1076.5028	819.5445	815.1151	1046.9275	1221.1302	1260.1389	1279.1371 (95)
Ext temp.	5.4000	5.7000	7.0000	8.8000	11.4000	14.0000	15.7000	15.7000	13.9000	11.2000	8.2000	5.7000 (96)
Heat loss rate W	2725.2317	2534.7420	2338.3201	2045.1192	1613.4070	1152.2013	856.4612	852.1013	1167.1253	1621.1005	2082.6827	2637.9574 (97)
Space heating kWh	1020.1298	707.1627	567.3850	331.0341	171.9515	0.0000	0.0000	0.0000	0.0000	297.5779	592.2316	1010.9623 (98a)
Space heating requirement - total per year (kWh/year)												4698.4349

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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	1020.1298	707.1627	567.3850	331.0341	171.9515	0.0000	0.0000	0.0000	0.0000	297.5779	592.2316	1010.9623	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)													4698.4349
Space heating per m2													(98c) / (4) = 17.8173 (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 %)													421.5949 (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	1020.1298	707.1627	567.3850	331.0341	171.9515	0.0000	0.0000	0.0000	0.0000	297.5779	592.2316	1010.9623	(98)
Space heating efficiency (main heating system 1)	421.5949	421.5949	421.5949	421.5949	421.5949	0.0000	0.0000	0.0000	0.0000	421.5949	421.5949	421.5949	(210)
Space heating fuel (main heating system)	241.9692	167.7351	134.5806	78.5195	40.7860	0.0000	0.0000	0.0000	0.0000	70.5839	140.4741	239.7947	(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	258.6610	228.5128	242.4157	212.5886	205.6439	184.8574	182.2365	189.7977	192.2164	214.8484	229.0371	255.7885	(64)
Efficiency of water heater (217)m	199.4241	199.4241	199.4241	199.4241	199.4241	199.4241	199.4241	199.4241	199.4241	199.4241	199.4241	199.4241	(216)
Fuel for water heating, kWh/month	129.7040	114.5864	121.5579	106.6013	103.1189	92.6957	91.3814	95.1729	96.3858	107.7345	114.8493	128.2636	(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	62.0176	56.0159	62.0176	60.0170	62.0176	60.0170	62.0176	62.0176	60.0170	62.0176	60.0170	62.0176	(231)
Lighting	44.4546	35.6631	32.1107	23.5256	18.1719	14.8466	16.5770	21.5474	27.9880	36.7217	41.4771	45.6901	(232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-100.5559	-124.7327	-179.5116	-205.4673	-213.4062	-201.2170	-188.7018	-185.3094	-165.7401	-141.2688	-104.6089	-88.8703	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity) (233b)m	-48.5543	-82.3176	-165.3122	-266.0984	-331.8642	-374.1446	-320.2066	-302.0162	-226.0362	-124.8385	-61.9772	-39.7798	(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													1114.4431 (211)
Space heating fuel - main system 2													0.0000 (213)
Space heating fuel - secondary													0.0000 (215)
Efficiency of water heater													199.4241
Water heating fuel used													1302.0517 (219)
Space cooling fuel													0.0000 (221)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.1000, SFP = 0.8360)													
mechanical ventilation fans (SFP = 0.8360)													730.2070 (230a)
Total electricity for the above, kWh/year													730.2070 (231)
Electricity for lighting (calculated in Appendix L)													358.7737 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation													-4242.5357 (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													-737.0602 (238)

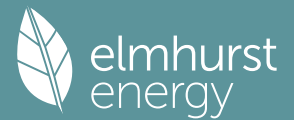
10a. Fuel costs - using BEDF prices (538)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1114.4431	25.1600	280.3939 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1302.0517	25.1600	327.5962 (247)
Energy for instantaneous electric shower(s)	0.0000	25.1600	0.0000 (247a)
Pumps, fans and electric keep-hot	730.2070	25.1600	183.7201 (249)
Energy for lighting	358.7737	25.1600	90.2675 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1899.3900	25.1600	-477.8865
PV Unit electricity exported	-2343.1457	5.8100	-136.1368
Total			-614.0233 (252)
Total energy cost			267.9543 (255)

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

Energy	Emission factor	Emissions
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	kWh/year	kg CO2/kWh	kg CO2/year
Space heating - main system 1	1114.4431	0.1556	173.3790 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1302.0517	0.1409	183.5160 (264)
Space and water heating			356.8950 (265)
Pumps, fans and electric keep-hot	730.2070	0.1387	101.2887 (267)
Energy for lighting	358.7737	0.1443	51.7821 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1899.3900	0.1353	-256.9258
PV Unit electricity exported	-2343.1457	0.1260	-295.2184
Total			-552.1442 (269)
Total CO2, kg/year			-42.1784 (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	1114.4431	1.5759	1756.2902 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1302.0517	1.5212	1980.6298 (278)
Space and water heating			3736.9200 (279)
Pumps, fans and electric keep-hot	730.2070	1.5128	1104.6572 (281)
Energy for lighting	358.7737	1.5338	550.2991 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1899.3900	1.4999	-2848.9837
PV Unit electricity exported	-2343.1457	0.4625	-1083.6752
Total			-3932.6589 (283)
Total Primary energy kWh/year			1459.2174 (286)