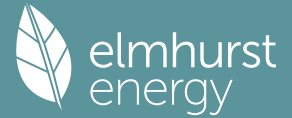


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Property Reference	Poyle Road - Plot 1		Issued on Date	26/02/2023	
Assessment Reference	Poyle Road Plot 1 - ASHP	Prop Type Ref			
Property	Plot 1, 54, Poyle Road, Tongham, GU10 1DU				
SAP Rating	80 C	DER	3.83	TER	7.95
Environmental	96 A	% DER < TER	51.82		
CO ₂ Emissions (t/year)	0.73	DFEE	33.16	TFEE	35.94
Compliance Check	See BREL	% DFEE < TFEE	7.74		
% DPER < TPER	2.88	DPER	40.42	TPER	41.62
Assessor Details	Mr. Steven Leahy			Assessor ID	A593-0001
Client	0864, Harding Rose Architects				

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	86.2400 (1b)	x 2.4000 (2b)	= 206.9760 (1b)
First floor	86.2400 (1c)	x 2.7000 (2c)	= 232.8480 (1c)
Second floor	40.1800 (1d)	x 2.0000 (2d)	= 80.3600 (1d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	212.6600		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 520.1840 (5)

2. Ventilation rate

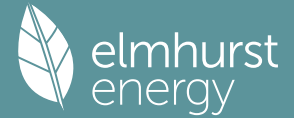
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) = 0.0769 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3269 (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) = 0.2779 (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	0.3543	0.3473	0.3404	0.3056	0.2987	0.2640	0.2640	0.2570	0.2779	0.2987	0.3126	0.3265 (22b)
Effective ac	0.5628	0.5603	0.5579	0.5467	0.5446	0.5348	0.5348	0.5330	0.5386	0.5446	0.5489	0.5533 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Entrance Door			2.8400	1.0000	2.8400		(26a)
Windows (Uw = 1.20)			27.4800	1.1450	31.4656		(27)
North Roof Windows			1.9200	1.1450	2.1985		(27a)
Ground Floor			86.2400	0.1300	11.2112	110.0000	9486.4000 (28a)
External Wall 1	206.1200	30.3200	175.8000	0.1600	28.1280	60.0000	10548.0000 (29a)
Main Roof	99.9600	1.9200	98.0400	0.1300	12.7452	9.0000	882.3600 (30)

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Total net area of external elements Aum(A, m2)	392.3200			(31)
Fabric heat loss, W/K = Sum (A x U)	(26)...(30) + (32) =	88.5885		(33)
Stud Walls	299.3600		9.0000	2694.2400 (32c)
Internal Floor	86.2400		18.0000	1552.3200 (32d)
Internal Floor 2	40.1800		18.0000	723.2400 (32d)
Internal Ceiling	86.2400		9.0000	776.1600 (32e)
Internal Ceiling 2	86.2400		9.0000	776.1600 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 27438.8800 (34)
 Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 129.0270 (35)

List of Thermal Bridges			
K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	20.9500	0.0210	0.4400
E3 Sill	19.6000	0.0270	0.5292
E4 Jamb	38.4000	0.0410	1.5744
E5 Ground floor (normal)	37.2000	0.0560	2.0832
E6 Intermediate floor within a dwelling	65.0000	0.0100	0.6500
E16 Corner (normal)	26.0000	0.0000	0.0000
E11 Eaves (insulation at rafter level)	19.6000	0.1500	2.9400
E13 Gable (insulation at rafter level)	20.4000	0.0530	1.0812
R1 Head of roof window	2.4000	0.2400	0.5760
R2 Sill of roof window	2.4000	0.2400	0.5760
R3 Jamb of roof window	6.4000	0.2400	1.5360
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			11.9860 (36)
Point Thermal bridges			(36a) = 0.0000
Total fabric heat loss			(33) + (36) + (36a) = 100.5745 (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	96.6029	96.1846	95.7746	93.8487	93.4883	91.8110	91.8110	91.5003	92.4571	93.4883	94.2173	94.9794 (38)
Average = Sum(39)m / 12 =	197.1774	196.7591	196.3490	194.4231	194.0628	192.3854	192.3854	192.0748	193.0315	194.0628	194.7918	195.5538 (39)
	197.1774	196.7591	196.3490	194.4231	194.0628	192.3854	192.3854	192.0748	193.0315	194.0628	194.7918	195.5538 (39)
HLP	0.9272	0.9252	0.9233	0.9142	0.9125	0.9047	0.9047	0.9032	0.9077	0.9125	0.9160	0.9196 (40)
HLP (average)												0.9142
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

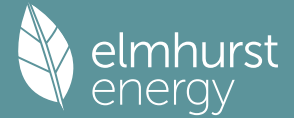
4. Water heating energy requirements (kWh/year)

Assumed occupancy													3.0184 (42)
Hot water usage for mixer showers	102.8889	101.3427	99.0895	94.7785	91.5971	88.0493	86.0327	88.2687	90.7199	94.5293	98.9328	102.4947	102.4947 (42a)
Hot water usage for baths	32.3018	31.8221	31.1465	29.9009	28.9682	27.9340	27.3754	28.0462	28.7766	29.8833	31.1545	32.1926	32.1926 (42b)
Hot water usage for other uses	45.5413	43.8852	42.2292	40.5732	38.9171	37.2611	37.2611	38.9171	40.5732	42.2292	43.8852	45.5413	45.5413 (42c)
Average daily hot water use (litres/day)	42.9353	37.8175	39.7609	33.9334	32.2041	28.2648	27.3332	28.8315	29.6073	33.9197	37.1784	42.3292	42.3292 (46)
Daily hot water use	180.7320	177.0500	172.4653	165.2526	159.4825	153.2444	150.6691	155.2321	160.0697	166.6417	173.9726	180.2286	180.2286 (44)
Energy conte	286.2353	252.1169	265.0727	226.2226	214.6941	188.4318	182.2212	192.2098	197.3820	226.1313	247.8559	282.1944	282.1944 (45)
Energy content (annual)													Total = Sum(45)m = 2760.7679
Distribution loss (46)m = 0.15 x (45)m	42.9353	37.8175	39.7609	33.9334	32.2041	28.2648	27.3332	28.8315	29.6073	33.9197	37.1784	42.3292	42.3292 (46)
Water storage loss:													
Store volume													210.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													2.3000 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													1.2420 (55)
Total storage loss	38.5020	34.7760	38.5020	37.2600	38.5020	37.2600	38.5020	38.5020	37.2600	38.5020	37.2600	38.5020	38.5020 (56)
If cylinder contains dedicated solar storage	38.5020	34.7760	38.5020	37.2600	38.5020	37.2600	38.5020	38.5020	37.2600	38.5020	37.2600	38.5020	38.5020 (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	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	0.0000 (61)
Total heat required for water heating calculated for each month	347.9997	307.9041	326.8371	285.9946	276.4585	248.2038	243.9856	253.9742	257.1540	287.8957	307.6279	343.9588	343.9588 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	347.9997	307.9041	326.8371	285.9946	276.4585	248.2038	243.9856	253.9742	257.1540	287.8957	307.6279	343.9588	343.9588 (64)
Total per year (kWh/year)													Total per year (kWh/year) = Sum(64)m = 3487.9939 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =													0.0000 (64a)
Heat gains from water heating, kWh/month	144.5848	128.4586	137.5482	123.0366	120.7973	110.4712	110.0001	113.3213	113.4471	124.6002	130.2297	143.2412	143.2412 (65)

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

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

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(66)m	150.9193	150.9193	150.9193	150.9193	150.9193	150.9193	150.9193	150.9193	150.9193	150.9193	150.9193	150.9193	150.9193	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	207.1733	229.3704	207.1733	214.0791	207.1733	214.0791	207.1733	207.1733	214.0791	207.1733	214.0791	207.1733	214.0791	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	382.9238	386.8974	376.8842	355.5672	328.6584	303.3679	286.4722	282.4987	292.5119	313.8289	340.7377	366.0282	366.0282	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	38.0919	38.0919	38.0919	38.0919	38.0919	38.0919	38.0919	38.0919	38.0919	38.0919	38.0919	38.0919	38.0919	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-120.7354	-120.7354	-120.7354	-120.7354	-120.7354	-120.7354	-120.7354	-120.7354	-120.7354	-120.7354	-120.7354	-120.7354	-120.7354	(71)
Water heating gains (Table 5)	194.3344	191.1587	184.8766	170.8842	162.3620	153.4322	147.8496	152.3135	157.5654	167.4733	180.8746	192.5285	192.5285	(72)
Total internal gains	855.7073	878.7023	840.2099	811.8063	769.4694	739.1549	709.7709	710.2613	732.4322	759.7513	806.9672	837.0058	837.0058	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data g or Table 6b	Specific data FF or Table 6c	Access factor Table 6d	Gains W
North	16.3800	10.6334	0.7600	0.7000	0.7700	64.2141 (74)
South	9.8400	46.7521	0.7600	0.7000	0.7700	169.6058 (78)
West	1.2600	19.6403	0.7600	0.7000	0.7700	9.1235 (80)
North	1.9200	26.0000	0.7600	0.7000	1.0000	23.9017 (82)

Solar gains	266.8452	467.9767	680.0006	915.6118	1096.9678	1121.7052	1067.7548	926.6263	760.2363	527.5308	321.9699	226.8951	226.8951	(83)
Total gains	1122.5525	1346.6789	1520.2105	1727.4181	1866.4372	1860.8602	1777.5257	1636.8877	1492.6685	1287.2821	1128.9370	1063.9008	1063.9008	(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	38.6551	38.7373	38.8182	39.2027	39.2755	39.6179	39.6179	39.6820	39.4853	39.2755	39.1285	38.9760	
alpha	3.5770	3.5825	3.5879	3.6135	3.6184	3.6412	3.6412	3.6455	3.6324	3.6184	3.6086	3.5984	
util living area	0.9859	0.9726	0.9480	0.8854	0.7701	0.6033	0.4589	0.5119	0.7374	0.9186	0.9747	0.9882	(86)
MIT	19.4812	19.6956	19.9916	20.3731	20.6729	20.8437	20.8951	20.8854	20.7627	20.3646	19.8576	19.4468	(87)
Th 2	20.1444	20.1461	20.1477	20.1554	20.1568	20.1635	20.1635	20.1648	20.1610	20.1568	20.1539	20.1509	(88)
util rest of house	0.9834	0.9679	0.9389	0.8651	0.7305	0.5399	0.3782	0.4289	0.6804	0.8998	0.9696	0.9862	(89)
MIT 2	18.3350	18.6083	18.9830	19.4600	19.8130	19.9992	20.0437	20.0385	19.9215	19.4593	18.8222	18.2960	(90)
Living area fraction									fLA = Living area / (4) =				0.1153 (91)
MIT	18.4671	18.7337	19.0992	19.5652	19.9121	20.0966	20.1418	20.1361	20.0184	19.5636	18.9415	18.4286	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.4671	18.7337	19.0992	19.5652	19.9121	20.0966	20.1418	20.1361	20.0184	19.5636	18.9415	18.4286	(93)

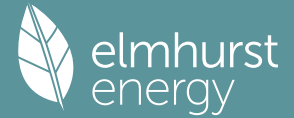
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9767	0.9577	0.9248	0.8485	0.7178	0.5345	0.3761	0.4259	0.6696	0.8835	0.9598	0.9803	(94)
Useful gains	1096.4002	1289.7210	1405.8209	1465.6708	1339.7816	994.5837	668.4390	697.2233	999.5544	1137.3721	1083.5015	1042.9860	(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	2793.4309	2721.8961	2473.8487	2073.5693	1593.6584	1057.4578	681.3892	717.6070	1142.4429	1739.5083	2306.6313	2782.4665	(97)
Space heating kWh	1262.5908	962.4217	794.6127	437.6869	188.8843	0.0000	0.0000	0.0000	0.0000	447.9893	880.6534	1294.1735	(98a)
Space heating requirement - total per year (kWh/year)												6269.0127	
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	1262.5908	962.4217	794.6127	437.6869	188.8843	0.0000	0.0000	0.0000	0.0000	447.9893	880.6534	1294.1735	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												6269.0127	
Space heating per m2												(98c) / (4) =	29.4790 (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 %)													170.0000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement	1262.5908	962.4217	794.6127	437.6869	188.8843	0.0000	0.0000	0.0000	0.0000	447.9893	880.6534	1294.1735	(98)
Space heating efficiency (main heating system 1)													

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Space heating fuel (main heating system)	170.0000	170.0000	170.0000	170.0000	170.0000	0.0000	0.0000	0.0000	0.0000	170.0000	170.0000	170.0000	(210)	
Space heating efficiency (main heating system 2)	742.7005	566.1304	467.4193	257.4629	111.1084	0.0000	0.0000	0.0000	0.0000	263.5231	518.0314	761.2785	(211)	
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)	
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)	
Water heating requirement	347.9997	307.9041	326.8371	285.9946	276.4585	248.2038	243.9856	253.9742	257.1540	287.8957	307.6279	343.9588	(64)	
Efficiency of water heater (217)m	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	(216)	
Fuel for water heating, kWh/month	204.7057	181.1200	192.2571	168.2321	162.6226	146.0022	143.5210	149.3966	151.2670	169.3504	180.9576	202.3287	(219)	
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)	
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(231)	
Lighting	55.0483	44.1618	39.7628	29.1319	22.5023	18.3846	20.5274	26.6823	34.6576	45.4727	51.3613	56.5782	(232)	
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-22.0068	-34.7315	-55.4686	-68.2422	-77.4729	-71.5255	-70.5490	-63.8757	-52.9271	-41.5876	-25.3214	-18.6234	(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	-3.0365	-7.0585	-15.7045	-27.1438	-40.3685	-44.3313	-43.7767	-36.0113	-25.3044	-11.8353	-4.3835	-2.3335	(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												3687.6545	(211)	
Space heating fuel - main system 2												0.0000	(213)	
Space heating fuel - secondary												0.0000	(215)	
Efficiency of water heater												170.0000	(216)	
Water heating fuel used												2051.7611	(219)	
Space cooling fuel												0.0000	(221)	
Electricity for pumps and fans:														
Total electricity for the above, kWh/year													0.0000	(231)
Electricity for lighting (calculated in Appendix L)													444.2711	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV generation													-863.6197	(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													5320.0671	(238)

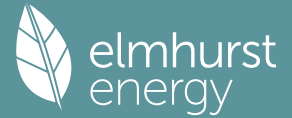
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	3687.6545	0.1553	572.7900 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2051.7611	0.1410	289.2589 (264)
Space and water heating			862.0489 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	444.2711	0.1443	64.1221 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-602.3318	0.1331	-80.1562
PV Unit electricity exported	-261.2879	0.1215	-31.7380
Total			-111.8942 (269)
Total CO2, kg/year			814.2768 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.8300 (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	3687.6545	1.5750	5808.2243 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2051.7611	1.5213	3121.3442 (278)
Space and water heating			8929.5684 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	444.2711	1.5338	681.4379 (282)
Energy saving/generation technologies			

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PV Unit electricity used in dwelling	-602.3318	1.4918	-898.5304
PV Unit electricity exported	-261.2879	0.4456	-116.4241
Total			-1014.9545 (283)
Total Primary energy kWh/year			8596.0518 (286)
Dwelling Primary energy Rate (DPER)			40.4200 (287)

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	86.2400 (1b)	x 2.4000 (2b)	= 206.9760 (1b) -
First floor	86.2400 (1c)	x 2.7000 (2c)	= 232.8480 (1c) -
Second floor	40.1800 (1d)	x 2.0000 (2d)	= 80.3600 (1d) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	212.6600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 520.1840 (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	4 * 10 =	40.0000 (7a)	
Number of passive vents	0 * 10 =	0.0000 (7b)	
Number of flueless gas fires	0 * 40 =	0.0000 (7c)	
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.0769 (8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3269	(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) =		0.2779 (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	0.3543	0.3473	0.3404	0.3056	0.2987	0.2640	0.2640	0.2570	0.2779	0.2987	0.3126	0.3265 (22b)
Effective ac	0.5628	0.5603	0.5579	0.5467	0.5446	0.5348	0.5348	0.5330	0.5386	0.5446	0.5489	0.5533 (25)

3. Heat losses and heat loss parameter

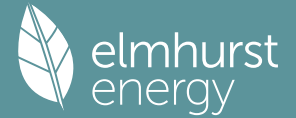
Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Semi-glazed door			2.8400	1.0000	2.8400		(26a)
TER Opening Type (Uw = 1.20)			27.4800	1.1450	31.4656		(27)
North Roof Windows			1.9200	2.0221	3.8824		(27a)
Ground Floor			86.2400	0.1300	11.2112		(28a)
External Wall 1	206.1200	30.3200	175.8000	0.1800	31.6440		(29a)
Main Roof	99.9600	1.9200	98.0400	0.1100	10.7844		(30)
Total net area of external elements Aum(A, m ²)			392.3200				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	91.8276	(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 129.0270 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	20.9500	0.0500	1.0475
E3 Sill	19.6000	0.0500	0.9800
E4 Jamb	38.4000	0.0500	1.9200
E5 Ground floor (normal)	37.2000	0.1600	5.9520
E6 Intermediate floor within a dwelling	65.0000	0.0000	0.0000
E16 Corner (normal)	26.0000	0.0900	2.3400
E11 Eaves (insulation at rafter level)	19.6000	0.0400	0.7840

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[Jan]		Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
North		16.3800	10.6334	0.6300	0.7000	0.7700	53.2301 (74)
South		9.8400	46.7521	0.6300	0.7000	0.7700	140.5943 (78)
West		1.2600	19.6403	0.6300	0.7000	0.7700	7.5629 (80)
North		1.9200	26.0000	0.6300	0.7000	1.0000	19.8132 (82)

Solar gains	221.2006	387.9280	563.6847	758.9940	909.3285	929.8346	885.1125	768.1245	630.1959	437.2953	266.8961	188.0841 (83)
Total gains	1046.2749	1236.3847	1374.5602	1543.6872	1652.9969	1644.5818	1571.4297	1454.2926	1337.7670	1170.6400	1045.3394	994.7578 (84)

7. Mean internal temperature (heating season)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
tau	37.3744	37.4512	37.5268	37.8861	37.9540	38.2737	38.2737	38.3335	38.1500	37.9540	37.8168	37.6743
alpha	3.4916	3.4967	3.5018	3.5257	3.5303	3.5516	3.5516	3.5556	3.5433	3.5303	3.5211	3.5116
util living area	0.9887	0.9791	0.9618	0.9159	0.8242	0.6723	0.5243	0.5779	0.7915	0.9386	0.9803	0.9905 (86)
MIT	18.9486	19.2115	19.5942	20.1136	20.5609	20.8528	20.9544	20.9353	20.7217	20.1398	19.4575	18.9070 (87)
Th 2	20.1177	20.1193	20.1209	20.1286	20.1300	20.1366	20.1366	20.1379	20.1341	20.1300	20.1271	20.1241 (88)
util rest of house	0.9867	0.9754	0.9546	0.8993	0.7885	0.6067	0.4335	0.4869	0.7377	0.9232	0.9761	0.9888 (89)
MIT 2	17.6827	18.0184	18.5045	19.1581	19.6955	20.0195	20.1108	20.0987	19.8898	19.2010	18.3389	17.6337 (90)
Living area fraction	17.8286	18.1559	18.6301	19.2682	19.7953	20.1155	20.2081	20.1951	19.9857	19.3092	18.4678	17.7805 (91)
MIT	17.8286	18.1559	18.6301	19.2682	19.7953	20.1155	20.2081	20.1951	19.9857	19.3092	18.4678	17.7805 (92)
Temperature adjustment												0.0000
adjusted MIT	17.8286	18.1559	18.6301	19.2682	19.7953	20.1155	20.2081	20.1951	19.9857	19.3092	18.4678	17.7805 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9787	0.9635	0.9382	0.8791	0.7727	0.6050	0.4414	0.4934	0.7271	0.9043	0.9647	0.9818 (94)
Useful gains	1023.9970	1191.2788	1289.6777	1357.0605	1277.3144	994.9109	693.5997	717.4937	972.7184	1058.6577	1008.4118	976.6622 (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	2758.9445	2697.7792	2463.6929	2085.8695	1625.6867	1098.3705	718.5183	754.5846	1175.8868	1748.9755	2291.1620	2747.4732 (97)
Space heating kWh	1290.8009	1012.3682	873.4673	524.7425	259.1890	0.0000	0.0000	0.0000	0.0000	513.5965	923.5801	1317.4834 (98a)
Space heating requirement - total per year (kWh/year)												6715.2280
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	1290.8009	1012.3682	873.4673	524.7425	259.1890	0.0000	0.0000	0.0000	0.0000	513.5965	923.5801	1317.4834 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												6715.2280
Space heating per m2												(98c) / (4) = 31.5773 (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	1290.8009	1012.3682	873.4673	524.7425	259.1890	0.0000	0.0000	0.0000	0.0000	513.5965	923.5801	1317.4834 (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)	1398.4842	1096.8237	946.3351	568.5184	280.8115	0.0000	0.0000	0.0000	0.0000	556.4426	1000.6285	1427.3926 (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	259.3324	229.2441	243.6033	214.6817	208.3635	188.0616	185.9815	193.2960	195.3053	217.3768	230.5853	256.5984 (64)
Efficiency of water heater	87.1555	86.9886	86.6684	85.9845	84.5504	79.8000	79.8000	79.8000	79.8000	85.9184	86.8432	79.8000 (216)
Fuel for water heating, kWh/month	297.5512	263.5335	281.0751	249.6750	246.4370	235.6662	233.0595	242.2255	244.7435	253.0038	265.5191	294.2747 (219)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)

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Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	43.0465	34.5335	31.0936	22.7805	17.5963	14.3763	16.0520	20.8649	27.1015	35.5586	40.1634	44.2429	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-75.7241	-104.2949	-146.4056	-160.4954	-169.4791	-156.6979	-154.5424	-147.5160	-134.7803	-117.0953	-82.2820	-65.7414	(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	-50.5482	-105.3584	-207.7295	-309.6877	-407.4100	-408.8065	-404.1969	-343.3432	-253.0051	-150.1346	-67.2889	-40.0647	(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												7275.4366	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												79.8000	
Water heating fuel used												3106.7643	(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)												347.4101	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-4262.6281	(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												6552.9829	(238)

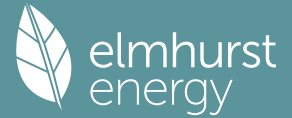
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	7275.4366	0.2100	1527.8417 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3106.7643	0.2100	652.4205 (264)
Space and water heating			2180.2622 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	347.4101	0.1443	50.1420 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1515.0544	0.1351	-204.7407
PV Unit electricity exported	-2747.5737	0.1261	-346.4805
Total			-551.2212 (269)
Total CO2, kg/year			1691.1122 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			7.9500 (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	7275.4366	1.1300	8221.2434 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3106.7643	1.1300	3510.6436 (278)
Space and water heating			11731.8870 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	347.4101	1.5338	532.8692 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1515.0544	1.4995	-2271.7882
PV Unit electricity exported	-2747.5737	0.4629	-1271.8448
Total			-3543.6330 (283)
Total Primary energy kWh/year			8851.2240 (286)
Target Primary Energy Rate (TPER)			41.6200 (287)

Full SAP Calculation Printout



1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	86.2400 (1b)	x 2.4000 (2b)	= 206.9760 (1b)
First floor	86.2400 (1c)	x 2.7000 (2c)	= 232.8480 (1c)
Second floor	40.1800 (1d)	x 2.0000 (2d)	= 80.3600 (1d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	212.6600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 520.1840 (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	4 * 10 =	40.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.0769 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3269 (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) =	0.2779 (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	0.3543	0.3473	0.3404	0.3056	0.2987	0.2640	0.2640	0.2570	0.2779	0.2987	0.3126	0.3265 (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	0.5628	0.5603	0.5579	0.5467	0.5446	0.5348	0.5348	0.5330	0.5386	0.5446	0.5489	0.5533 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Entrance Door			2.8400	1.0000	2.8400		(26a)
Windows (Uw = 1.20)			27.4800	1.1450	31.4656		(27)
North Roof Windows			1.9200	1.1450	2.1985		(27a)
Ground Floor			86.2400	0.1300	11.2112	110.0000	9486.4000 (28a)
External Wall 1	206.1200	30.3200	175.8000	0.1600	28.1280	60.0000	10548.0000 (29a)
Main Roof	99.9600	1.9200	98.0400	0.1300	12.7452	9.0000	882.3600 (30)
Total net area of external elements Aum(A, m ²)			392.3200				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	88.5885	(33)
Stud Walls			299.3600			9.0000	2694.2400 (32c)
Internal Floor			86.2400			18.0000	1552.3200 (32d)
Internal Floor 2			40.1800			18.0000	723.2400 (32d)
Internal Ceiling			86.2400			9.0000	776.1600 (32e)
Internal Ceiling 2			86.2400			9.0000	776.1600 (32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	27438.8800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K		129.0270 (35)

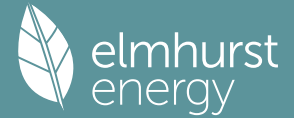
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	20.9500	0.0210	0.4400
E3 Sill	19.6000	0.0270	0.5292
E4 Jamb	38.4000	0.0410	1.5744
E5 Ground floor (normal)	37.2000	0.0560	2.0832
E6 Intermediate floor within a dwelling	65.0000	0.0100	0.6500
E16 Corner (normal)	26.0000	0.0000	0.0000
E11 Eaves (insulation at rafter level)	19.6000	0.1500	2.9400
E13 Gable (insulation at rafter level)	20.4000	0.0530	1.0812
R1 Head of roof window	2.4000	0.2400	0.5760
R2 Sill of roof window	2.4000	0.2400	0.5760
R3 Jamb of roof window	6.4000	0.2400	1.5360
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			11.9860 (36)
Point Thermal bridges			0.0000 (36a)
Total fabric heat loss			(33) + (36) + (36a) = 100.5745 (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
	96.6029	96.1846	95.7746	93.8487	93.4883	91.8110	91.8110	91.5003	92.4571	93.4883	94.2173	94.9794 (38)

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Heat transfer coeff	197.1774	196.7591	196.3490	194.4231	194.0628	192.3854	192.3854	192.0748	193.0315	194.0628	194.7918	195.5538 (39)
Average = Sum(39)m / 12 =												194.4214
HLP	Jan 0.9272	Feb 0.9252	Mar 0.9233	Apr 0.9142	May 0.9125	Jun 0.9047	Jul 0.9047	Aug 0.9032	Sep 0.9077	Oct 0.9125	Nov 0.9160	Dec 0.9196 (40)
HLP (average)												0.9142
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												3.0184 (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	32.3018	31.8221	31.1465	29.9009	28.9682	27.9340	27.3754	28.0462	28.7766	29.8833	31.1545	32.1926 (42b)
Hot water usage for other uses	45.5413	43.8852	42.2292	40.5732	38.9171	37.2611	37.2611	38.9171	40.5732	42.2292	43.8852	45.5413 (42c)
Average daily hot water use (litres/day)												71.3501 (43)
Daily hot water use	Jan 77.8431	Feb 75.7073	Mar 73.3757	Apr 70.4741	May 67.8853	Jun 65.1951	Jul 64.6365	Aug 66.9633	Sep 69.3498	Oct 72.1125	Nov 75.0398	Dec 77.7339 (44)
Energy conte	123.2845	107.8063	112.7758	96.4755	91.3867	80.1650	78.1722	82.9146	85.5152	97.8560	106.9079	121.7125 (45)
Energy content (annual)												Total = Sum(45)m = 1184.9722
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	104.7918	91.6353	95.8594	82.0042	77.6787	68.1402	66.4464	70.4774	72.6880	83.1776	90.8718	103.4557 (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	104.7918	91.6353	95.8594	82.0042	77.6787	68.1402	66.4464	70.4774	72.6880	83.1776	90.8718	103.4557 (64)
Total per year (kWh/year)												Total per year (kWh/year) = Sum(64)m = 1007.2264 (64)
Electric shower(s)	59.9250	53.3937	58.3038	55.6386	56.6827	54.0698	55.8721	56.6827	55.6386	58.3038	57.2075	59.9250 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												681.6432 (64a)
Heat gains from water heating, kWh/month	41.1792	36.2572	38.5408	34.4107	33.5903	30.5525	30.5796	31.7900	32.0816	35.3703	37.0198	40.8452 (65)

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

Metabolic gains (Table 5), Watts	Jan 150.9193	Feb 150.9193	Mar 150.9193	Apr 150.9193	May 150.9193	Jun 150.9193	Jul 150.9193	Aug 150.9193	Sep 150.9193	Oct 150.9193	Nov 150.9193	Dec 150.9193 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	207.1733	229.3704	207.1733	214.0791	207.1733	214.0791	207.1733	207.1733	214.0791	207.1733	214.0791	207.1733 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	382.9238	386.8974	376.8842	355.5672	328.6584	303.3679	286.4722	282.4987	292.5119	313.8289	340.7377	366.0282 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	38.0919	38.0919	38.0919	38.0919	38.0919	38.0919	38.0919	38.0919	38.0919	38.0919	38.0919	38.0919 (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)	-120.7354	-120.7354	-120.7354	-120.7354	-120.7354	-120.7354	-120.7354	-120.7354	-120.7354	-120.7354	-120.7354	-120.7354 (71)
Water heating gains (Table 5)	55.3484	53.9542	51.8022	47.7926	45.1483	42.4340	41.1016	42.7285	44.5578	47.5408	51.4164	54.8994 (72)
Total internal gains	713.7213	738.4979	704.1354	685.7147	649.2558	628.1568	603.0230	600.6763	619.4246	636.8188	674.5090	696.3767 (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	16.3800	10.6334	0.7600	0.7000	0.7700	64.2141 (74)						
South	9.8400	46.7521	0.7600	0.7000	0.7700	169.6058 (78)						
West	1.2600	19.6403	0.7600	0.7000	0.7700	9.1235 (80)						
North	1.9200	26.0000	0.7600	0.7000	1.0000	23.9017 (82)						
Solar gains	266.8452	467.9767	680.0006	915.6118	1096.9678	1121.7052	1067.7548	926.6263	760.2363	527.5308	321.9699	226.8951 (83)
Total gains	980.5665	1206.4745	1384.1360	1601.3266	1746.2235	1749.8620	1670.7778	1527.3026	1379.6610	1164.3496	996.4789	923.2718 (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	38.6551	38.7373	38.8182	39.2027	39.2755	39.6179	39.6179	39.6820	39.4853	39.2755	39.1285	38.9760
alpha	3.5770	3.5825	3.5879	3.6135	3.6184	3.6412	3.6412	3.6455	3.6324	3.6184	3.6086	3.5984
util living area	0.9907	0.9803	0.9599	0.9042	0.7962	0.6315	0.4847	0.5425	0.7701	0.9372	0.9827	0.9925 (86)
MIT	18.9716	19.2643	19.6716	20.2064	20.6362	20.8890	20.9677	20.9516	20.7631	20.1862	19.4844	18.9250 (87)
Th 2	20.1444	20.1461	20.1477	20.1554	20.1568	20.1635	20.1635	20.1648	20.1610	20.1568	20.1539	20.1509 (88)
util rest of house	0.9891	0.9768	0.9525	0.8863	0.7585	0.5675	0.4007	0.4566	0.7154	0.9218	0.9790	0.9912 (89)
MIT 2	18.2620	18.5536	18.9568	19.4807	19.8789	20.0955	20.1494	20.1421	20.0001	19.4710	18.7796	18.2203 (90)
Living area fraction									fLA = Living area / (4) =			0.1153 (91)
MIT	18.3438	18.6355	19.0392	19.5643	19.9662	20.1870	20.2437	20.2354	20.0881	19.5534	18.8609	18.3015 (92)
Temperature adjustment												0.0000
adjusted MIT	18.3438	18.6355	19.0392	19.5643	19.9662	20.1870	20.2437	20.2354	20.0881	19.5534	18.8609	18.3015 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9841	0.9684	0.9403	0.8715	0.7491	0.5694	0.4091	0.4642	0.7101	0.9080	0.9714	0.9869 (94)
Useful gains	964.9832	1168.3843	1301.5037	1395.4878	1308.0593	996.3732	683.4719	709.0202	979.6874	1057.2489	967.9449	911.2172 (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	2769.1198	2702.5895	2462.0527	2073.3862	1604.1635	1074.8497	701.0025	736.6865	1155.8836	1737.5265	2290.9199	2757.6021 (97)
Space heating kWh	1342.2776	1030.9859	863.4484	488.0868	220.3015	0.0000	0.0000	0.0000	0.0000	506.1265	952.5420	1373.7104 (98a)
Space heating requirement - total per year (kWh/year)												6777.4791
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	1342.2776	1030.9859	863.4484	488.0868	220.3015	0.0000	0.0000	0.0000	0.0000	506.1265	952.5420	1373.7104 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												6777.4791
Space heating per m2										(98c) / (4) =		31.8700 (99)

8c. Space cooling requirement

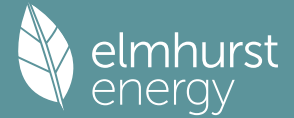
Calculated for June, July and August. See Table 10b												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	1808.4231	1423.6522	1459.7685	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8054	0.8696	0.8331	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1456.5381	1238.0568	1216.1650	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1909.8880	1823.4465	1665.0268	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	326.4120	435.5299	333.9532	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	81.6030	108.8825	83.4883	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												273.9737 (107)
Energy for space heating												31.8700 (99)
Energy for space cooling												1.2883 (108)
Total												33.1583 (109)
Fabric Energy Efficiency (DFEE)												33.2 (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	86.2400 (1b)	x 2.4000 (2b)	= 206.9760 (1b) -
First floor	86.2400 (1c)	x 2.7000 (2c)	= 232.8480 (1c) -
Second floor	40.1800 (1d)	x 2.0000 (2d)	= 80.3600 (1d) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	212.6600		(4)

Full SAP Calculation Printout



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	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	32.3018	31.8221	31.1465	29.9009	28.9682	27.9340	27.3754	28.0462	28.7766	29.8833	31.1545	32.1926					(42b)
Hot water usage for other uses	45.5413	43.8852	42.2292	40.5732	38.9171	37.2611	37.2611	38.9171	40.5732	42.2292	43.8852	45.5413					(42c)
Average daily hot water use (litres/day)																	(43)
Daily hot water use	77.8431	75.7073	73.3757	70.4741	67.8853	65.1951	64.6365	66.9633	69.3498	72.1125	75.0398	77.7339					(44)
Energy content (annual)	123.2845	107.8063	112.7758	96.4755	91.3867	80.1650	78.1722	82.9146	85.5152	97.8560	106.9079	121.7125					(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	104.7918	91.6353	95.8594	82.0042	77.6787	68.1402	66.4464	70.4774	72.6880	83.1776	90.8718	103.4557					(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	104.7918	91.6353	95.8594	82.0042	77.6787	68.1402	66.4464	70.4774	72.6880	83.1776	90.8718	103.4557					(64)
Total per year (kWh/year)																	
Electric shower(s)	59.9250	53.3937	58.3038	55.6386	56.6827	54.0698	55.8721	56.6827	55.6386	58.3038	57.2075	59.9250					(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a) _m																	(64a)
Heat gains from water heating, kWh/month	41.1792	36.2572	38.5408	34.4107	33.5903	30.5525	30.5796	31.7900	32.0816	35.3703	37.0198	40.8452					(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	150.9193	150.9193	150.9193	150.9193	150.9193	150.9193	150.9193	150.9193	150.9193	150.9193	150.9193	150.9193	150.9193	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	207.1733	229.3704	207.1733	214.0791	207.1733	214.0791	207.1733	207.1733	214.0791	207.1733	214.0791	207.1733	207.1733	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	382.9238	386.8974	376.8842	355.5672	328.6584	303.3679	286.4722	282.4987	292.5119	313.8289	340.7377	366.0282	366.0282	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	38.0919	38.0919	38.0919	38.0919	38.0919	38.0919	38.0919	38.0919	38.0919	38.0919	38.0919	38.0919	38.0919	(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	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-120.7354	-120.7354	-120.7354	-120.7354	-120.7354	-120.7354	-120.7354	-120.7354	-120.7354	-120.7354	-120.7354	-120.7354	-120.7354	(71)
Water heating gains (Table 5)	55.3484	53.9542	51.8022	47.7926	45.1483	42.4340	41.1016	42.7285	44.5578	47.5408	51.4164	54.8994	54.8994	(72)
Total internal gains	713.7213	738.4979	704.1354	685.7147	649.2558	628.1568	603.0230	600.6763	619.4246	636.8188	674.5090	696.3767	696.3767	(73)

6. Solar gains

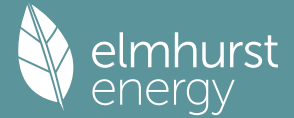
[Jan]	Area	Solar flux	g	FF	Access	Gains
	m ²	Table 6a	Specific data	Specific data	factor	W
		W/m ²	or Table 6b	or Table 6c	Table 6d	
North	16.3800	10.6334	0.6300	0.7000	0.7700	53.2301
South	9.8400	46.7521	0.6300	0.7000	0.7700	140.5943
West	1.2600	19.6403	0.6300	0.7000	0.7700	7.5629
North	1.9200	26.0000	0.6300	0.7000	1.0000	19.8132

Solar gains	221.2006	387.9280	563.6847	758.9940	909.3285	929.8346	885.1125	768.1245	630.1959	437.2953	266.8961	188.0841	188.0841	(83)
Total gains	934.9219	1126.4259	1267.8201	1444.7087	1558.5843	1557.9914	1488.1355	1368.8008	1249.6205	1074.1140	941.4051	884.4608	884.4608	(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	37.3744	37.4512	37.5268	37.8861	37.9540	38.2737	38.2737	38.3335	38.1500	37.9540	37.8168	37.6743			
alpha	3.4916	3.4967	3.5018	3.5257	3.5303	3.5516	3.5516	3.5556	3.5433	3.5303	3.5211	3.5116			
util living area	0.9920	0.9842	0.9695	0.9287	0.8438	0.6963	0.5483	0.6053	0.8165	0.9512	0.9856	0.9934			(86)
MIT	18.8560	19.1233	19.5138	20.0509	20.5198	20.8347	20.9474	20.9250	20.6882	20.0728	19.3734	18.8146			(87)
Th 2	20.1177	20.1193	20.1209	20.1286	20.1300	20.1366	20.1366	20.1379	20.1341	20.1300	20.1271	20.1241			(88)
util rest of house															

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MIT 2	0.9906	0.9813	0.9637	0.9141	0.8103	0.6313	0.4552	0.5128	0.7657	0.9384	0.9825	0.9922 (89)
Living area fraction	18.1282	18.3949	18.7829	19.3135	19.7563	20.0329	20.1132	20.1019	19.9176	19.3427	18.6507	18.0914 (90)
MIT	18.2121	18.4789	18.8672	19.3985	19.8443	20.1253	20.2093	20.1968	20.0064	19.4269	18.7340	18.1747 (92)
Temperature adjustment												0.0000
adjusted MIT	18.2121	18.4789	18.8672	19.3985	19.8443	20.1253	20.2093	20.1968	20.0064	19.4269	18.7340	18.1747 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9860	0.9739	0.9526	0.8991	0.7976	0.6303	0.4635	0.5196	0.7570	0.9250	0.9755	0.9883 (94)
Useful gains	921.8362	1096.9702	1207.7628	1298.9111	1243.1963	982.0493	689.6827	711.2012	946.0034	993.5883	918.3696	874.1383 (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	2837.1456	2763.5133	2511.8435	2112.0797	1635.5297	1100.3216	718.7705	754.9138	1180.0289	1772.6041	2344.8050	2827.2345 (97)
Space heating kWh	1424.9902	1119.9170	970.2361	585.4815	291.8960	0.0000	0.0000	0.0000	0.0000	579.5877	1027.0334	1453.1036 (98a)
Space heating requirement - total per year (kWh/year)												7452.2455
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	1424.9902	1119.9170	970.2361	585.4815	291.8960	0.0000	0.0000	0.0000	0.0000	579.5877	1027.0334	1453.1036 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												7452.2455
Space heating per m2												(98c) / (4) = 35.0430 (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	1871.9354	1473.6513	1511.1189	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7390	0.8146	0.7733	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1383.4266	1200.3675	1168.6234	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1690.9333	1614.9861	1483.9329	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	221.4048	308.4762	234.5903	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	55.3512	77.1191	58.6476	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												191.1178 (107)
Energy for space heating												35.0430 (99)
Energy for space cooling												0.8987 (108)
Total												35.9417 (109)
Fabric Energy Efficiency (TFEE)												35.9 (109)

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

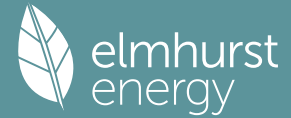
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	86.2400 (1b)	x 2.4000 (2b)	= 206.9760 (1b) -
First floor	86.2400 (1c)	x 2.7000 (2c)	= 232.8480 (1c) -
Second floor	40.1800 (1d)	x 2.0000 (2d)	= 80.3600 (1d) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	212.6600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	520.1840 (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)

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Number of intermittent extract fans 4 * 10 = 40.0000 (7a)
 Number of passive vents 0 * 10 = 0.0000 (7b)
 Number of flueless gas fires 0 * 40 = 0.0000 (7c)

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) = 40.0000 / (5) = 0.0769 (8)
 Pressure test Yes
 Pressure Test Method Blower Door
 Measured/design AP50 5.0000 (17)
 Infiltration rate 0.3269 (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) = 0.2779 (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 infiltr rate												
Effective ac	0.3543	0.3473	0.3404	0.3056	0.2987	0.2640	0.2640	0.2570	0.2779	0.2987	0.3126	0.3265 (22b)
	0.5628	0.5603	0.5579	0.5467	0.5446	0.5348	0.5348	0.5330	0.5386	0.5446	0.5489	0.5533 (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
Entrance Door			2.8400	1.0000	2.8400		(26a)
Windows (Uw = 1.20)			27.4800	1.1450	31.4656		(27)
North Roof Windows			1.9200	1.1450	2.1985		(27a)
Ground Floor			86.2400	0.1300	11.2112	110.0000	9486.4000 (28a)
External Wall 1	206.1200	30.3200	175.8000	0.1600	28.1280	60.0000	10548.0000 (29a)
Main Roof	99.9600	1.9200	98.0400	0.1300	12.7452	9.0000	882.3600 (30)
Total net area of external elements Aum(A, m2)			392.3200				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 88.5885		(33)
Stud Walls			299.3600			9.0000	2694.2400 (32c)
Internal Floor			86.2400			18.0000	1552.3200 (32d)
Internal Floor 2			40.1800			18.0000	723.2400 (32d)
Internal Ceiling			86.2400			9.0000	776.1600 (32e)
Internal Ceiling 2			86.2400			9.0000	776.1600 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 27438.8800 (34)
 Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 129.0270 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	20.9500	0.0210	0.4400
E3 Sill	19.6000	0.0270	0.5292
E4 Jamb	38.4000	0.0410	1.5744
E5 Ground floor (normal)	37.2000	0.0560	2.0832
E6 Intermediate floor within a dwelling	65.0000	0.0100	0.6500
E16 Corner (normal)	26.0000	0.0000	0.0000
E11 Eaves (insulation at rafter level)	19.6000	0.1500	2.9400
E13 Gable (insulation at rafter level)	20.4000	0.0530	1.0812
R1 Head of roof window	2.4000	0.2400	0.5760
R2 Sill of roof window	2.4000	0.2400	0.5760
R3 Jamb of roof window	6.4000	0.2400	1.5360

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 11.9860 (36)
 Point Thermal bridges (36a) = 0.0000
 Total fabric heat loss (33) + (36) + (36a) = 100.5745 (37)

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

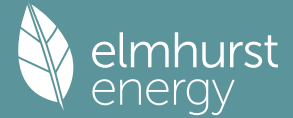
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	96.6029	96.1846	95.7746	93.8487	93.4883	91.8110	91.8110	91.5003	92.4571	93.4883	94.2173	94.9794 (38)
Average = Sum(39)m / 12 =	197.1774	196.7591	196.3490	194.4231	194.0628	192.3854	192.3854	192.0748	193.0315	194.0628	194.7918	195.5538 (39)
												194.4214

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.9272	0.9252	0.9233	0.9142	0.9125	0.9047	0.9047	0.9032	0.9077	0.9125	0.9160	0.9196 (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	3.0184 (42)											
Hot water usage for mixer showers	102.8889	101.3427	99.0895	94.7785	91.5971	88.0493	86.0327	88.2687	90.7199	94.5293	98.9328	102.4947 (42a)
Hot water usage for baths	32.3018	31.8221	31.1465	29.9009	28.9682	27.9340	27.3754	28.0462	28.7766	29.8833	31.1545	32.1926 (42b)
Hot water usage for other uses	45.5413	43.8852	42.2292	40.5732	38.9171	37.2611	37.2611	38.9171	40.5732	42.2292	43.8852	45.5413 (42c)
Average daily hot water use (litres/day)												166.2102 (43)
Daily hot water use	180.7320	177.0500	172.4653	165.2526	159.4825	153.2444	150.6691	155.2321	160.0697	166.6417	173.9726	180.2286 (44)
Energy conte	286.2353	252.1169	265.0727	226.2226	214.6941	188.4318	182.2212	192.2098	197.3820	226.1313	247.8559	282.1944 (45)

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Energy content (annual)												Total = Sum(45)m =	2760.7679	
Distribution loss (46)m = 0.15 x (45)m	42.9353	37.8175	39.7609	33.9334	32.2041	28.2648	27.3332	28.8315	29.6073	33.9197	37.1784	42.3292	(46)	
Water storage loss:														
Store volume												210.0000	(47)	
a) If manufacturer declared loss factor is known (kWh/day):												2.3000	(48)	
Temperature factor from Table 2b												0.5400	(49)	
Enter (49) or (54) in (55)												1.2420	(55)	
Total storage loss	38.5020	34.7760	38.5020	37.2600	38.5020	37.2600	38.5020	38.5020	37.2600	38.5020	37.2600	38.5020	(56)	
If cylinder contains dedicated solar storage	38.5020	34.7760	38.5020	37.2600	38.5020	37.2600	38.5020	38.5020	37.2600	38.5020	37.2600	38.5020	(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	347.9997	307.9041	326.8371	285.9946	276.4585	248.2038	243.9856	253.9742	257.1540	287.8957	307.6279	343.9588	(62)	
MWHRs	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)	
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)	
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)	
FGHRs	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)	
Output from w/h	347.9997	307.9041	326.8371	285.9946	276.4585	248.2038	243.9856	253.9742	257.1540	287.8957	307.6279	343.9588	(64)	
												Total per year (kWh/year) = Sum(64)m =	3487.9939	(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	144.5848	128.4586	137.5482	123.0366	120.7973	110.4712	110.0001	113.3213	113.4471	124.6002	130.2297	143.2412	(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	181.1032	181.1032	181.1032	181.1032	181.1032	181.1032	181.1032	181.1032	181.1032	181.1032	181.1032	181.1032	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	62.8912	55.8594	45.4279	34.3918	25.7083	21.7040	23.4520	30.4838	40.9152	51.9513	60.6348	64.6391	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	571.5281	577.4588	562.5137	530.6973	490.5349	452.7879	427.5705	421.6398	436.5850	468.4013	508.5638	546.3108	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	56.1287	56.1287	56.1287	56.1287	56.1287	56.1287	56.1287	56.1287	56.1287	56.1287	56.1287	56.1287	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-120.7354	-120.7354	-120.7354	-120.7354	-120.7354	-120.7354	-120.7354	-120.7354	-120.7354	-120.7354	-120.7354	-120.7354	(71)
Water heating gains (Table 5)	194.3344	191.1587	184.8766	170.8842	162.3620	153.4322	147.8496	152.3135	157.5654	167.4733	180.8746	192.5285	(72)
Total internal gains	948.2501	943.9733	912.3146	855.4698	798.1016	744.4205	715.3685	720.9336	751.5621	807.3224	869.5696	922.9748	(73)

6. Solar gains

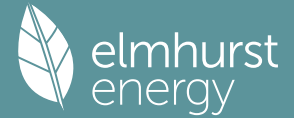
[Jan]	Area m ²	Solar flux Table 6a W/m ²	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
North	16.3800	10.6334	0.7600	0.7000	0.7700	64.2141 (74)
South	9.8400	46.7521	0.7600	0.7000	0.7700	169.6058 (78)
West	1.2600	19.6403	0.7600	0.7000	0.7700	9.1235 (80)
North	1.9200	26.0000	0.7600	0.7000	1.0000	23.9017 (82)

Solar gains	266.8452	467.9767	680.0006	915.6118	1096.9678	1121.7052	1067.7548	926.6263	760.2363	527.5308	321.9699	226.8951	(83)
Total gains	1215.0953	1411.9499	1592.3152	1771.0816	1895.0693	1866.1257	1783.1233	1647.5599	1511.7984	1334.8532	1191.5395	1149.8698	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)	
Utilisation factor for gains for living area, ni1,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
tau	38.6551	38.7373	38.8182	39.2027	39.2755	39.6179	39.6179	39.6820	39.4853	39.2755	39.1285	38.9760		
alpha	3.5770	3.5825	3.5879	3.6135	3.6184	3.6412	3.6412	3.6455	3.6324	3.6184	3.6086	3.5984		
util living area	0.9820	0.9686	0.9411	0.8786	0.7640	0.6020	0.4576	0.5091	0.7320	0.9109	0.9704	0.9850	(86)	
MIT	19.5378	19.7335	20.0293	20.3907	20.6798	20.8442	20.8952	20.8859	20.7666	20.3866	19.8943	19.5002	(87)	
Th 2	20.1444	20.1461	20.1477	20.1554	20.1568	20.1635	20.1635	20.1648	20.1610	20.1568	20.1539	20.1509	(88)	
util rest of house	0.9789	0.9633	0.9310	0.8575	0.7240	0.5386	0.3771	0.4264	0.6747	0.8908	0.9644	0.9824	(89)	
MIT 2	18.4069	18.6560	19.0294	19.4806	19.8201	19.9997	20.0438	20.0388	19.9251	19.4853	18.8682	18.3638	(90)	
Living area fraction												fLA = Living area / (4) =	0.1153	(91)
MIT	18.5373	18.7802	19.1447	19.5855	19.9192	20.0970	20.1419	20.1364	20.0221	19.5892	18.9865	18.4948	(92)	
Temperature adjustment												0.0000		
adjusted MIT	18.5373	18.7802	19.1447	19.5855	19.9192	20.0970	20.1419	20.1364	20.0221	19.5892	18.9865	18.4948	(93)	

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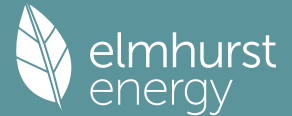
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9710	0.9522	0.9162	0.8410	0.7116	0.5333	0.3750	0.4235	0.6641	0.8743	0.9537	0.9755	(94)
Useful gains	1179.8614	1344.4957	1458.8983	1489.4464	1348.4420	995.1243	668.5844	697.6749	1004.0539	1167.1042	1136.3464	1121.7099	(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	2807.2659	2731.0454	2482.7665	2077.5097	1595.0417	1057.5403	681.4117	717.6765	1143.1542	1744.4661	2315.3919	2795.4050	(97)
Space heating kwh	1210.7890	931.7614	761.7580	423.4056	183.4702	0.0000	0.0000	0.0000	0.0000	429.5573	848.9128	1245.2291	(98a)
Space heating requirement - total per year (kWh/year)												6034.8832	
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	1210.7890	931.7614	761.7580	423.4056	183.4702	0.0000	0.0000	0.0000	0.0000	429.5573	848.9128	1245.2291	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												6034.8832	
Space heating per m2										(98c) / (4) =		28.3781	(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 %)													170.0000	(206)
Efficiency of main space heating system 2 (in %)													0.0000	(207)
Efficiency of secondary/supplementary heating system, %													0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	1210.7890	931.7614	761.7580	423.4056	183.4702	0.0000	0.0000	0.0000	0.0000	429.5573	848.9128	1245.2291	(98)	
Space heating efficiency (main heating system 1)	170.0000	170.0000	170.0000	170.0000	170.0000	0.0000	0.0000	0.0000	0.0000	170.0000	170.0000	170.0000	(210)	
Space heating fuel (main heating system)	712.2288	548.0949	448.0929	249.0621	107.9236	0.0000	0.0000	0.0000	0.0000	252.6808	499.3605	732.4877	(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	347.9997	307.9041	326.8371	285.9946	276.4585	248.2038	243.9856	253.9742	257.1540	287.8957	307.6279	343.9588	(64)	
Efficiency of water heater	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	(216)	
Fuel for water heating, kWh/month	204.7057	181.1200	192.2571	168.2321	162.6226	146.0022	143.5210	149.3966	151.2670	169.3504	180.9576	202.3287	(219)	
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)	
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(231)	
Lighting	55.0483	44.1618	39.7628	29.1319	22.5023	18.3846	20.5274	26.6823	34.6576	45.4727	51.3613	56.5782	(232)	
Electricity generated by PVs (Appendix M) (negative quantity)	-21.9757	-34.6814	-55.3471	-68.1268	-77.3949	-71.5255	-70.5490	-63.8757	-52.9271	-41.5188	-25.2870	-18.6007	(233a)	
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)	
Electricity generated by PVs (Appendix M) (negative quantity)	-3.0676	-7.1085	-15.8260	-27.2592	-40.4465	-44.3313	-43.7767	-36.0113	-25.3044	-11.9042	-4.4179	-2.3563	(233b)	
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)	
Annual totals kWh/year														
Space heating fuel - main system 1													3549.9313	(211)
Space heating fuel - main system 2													0.0000	(213)
Space heating fuel - secondary													0.0000	(215)
Efficiency of water heater													170.0000	
Water heating fuel used													2051.7611	(219)
Space cooling fuel													0.0000	(221)
Electricity for pumps and fans:														
Total electricity for the above, kWh/year													0.0000	(231)
Electricity for lighting (calculated in Appendix L)													444.2711	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV generation													-863.6197	(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													5182.3439	(238)

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10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	3549.9313	16.4900	585.3837 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2051.7611	16.4900	338.3354 (247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000 (247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (249)
Energy for lighting	444.2711	16.4900	73.2603 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-601.8097	16.4900	-99.2384
PV Unit electricity exported	-261.8100	5.5900	-14.6352
Total			-113.8736 (252)
Total energy cost			883.1058 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	1.2339 (257)
SAP value		79.9990
SAP rating (Section 12)		80 (258)
SAP band		C

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	3549.9313	0.1553	551.3720 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2051.7611	0.1410	289.2589 (264)
Space and water heating			840.6309 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	444.2711	0.1443	64.1221 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-601.8097	0.1331	-80.0794
PV Unit electricity exported	-261.8100	0.1215	-31.8224
Total			-111.9018 (269)
Total CO2, kg/year			792.8511 (272)
CO2 emissions per m2			3.7300 (273)
EI value			95.8767
EI rating			96 (274)
EI band			A

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

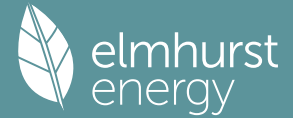
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	86.2400 (1b)	x 2.4000 (2b)	= 206.9760 (1b) -
First floor	86.2400 (1c)	x 2.7000 (2c)	= 232.8480 (1c) -
Second floor	40.1800 (1d)	x 2.0000 (2d)	= 80.3600 (1d) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	212.6600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	520.1840 (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)

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Number of blocked chimneys 0 * 20 = 0.0000 (6f)
 Number of intermittent extract fans 4 * 10 = 40.0000 (7a)
 Number of passive vents 0 * 10 = 0.0000 (7b)
 Number of flueless gas fires 0 * 40 = 0.0000 (7c)

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) = 40.0000 / (5) = 0.0769 (8)
 Pressure test Yes
 Pressure Test Method Blower Door
 Measured/design AP50 5.0000 (17)
 Infiltration rate 0.3269 (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) = 0.2779 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.3000	4.0000	3.9000	3.6000	3.7000	3.3000	3.3000	3.1000	3.1000	3.4000	3.4000	3.8000 (22)
Wind factor	1.0750	1.0000	0.9750	0.9000	0.9250	0.8250	0.8250	0.7750	0.7750	0.8500	0.8500	0.9500 (22a)
Adj infilt rate	0.2987	0.2779	0.2709	0.2501	0.2570	0.2292	0.2292	0.2153	0.2153	0.2362	0.2362	0.2640 (22b)
Effective ac	0.5446	0.5386	0.5367	0.5313	0.5330	0.5263	0.5263	0.5232	0.5232	0.5279	0.5279	0.5348 (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
Entrance Door			2.8400	1.0000	2.8400		(26a)
Windows (Uw = 1.20)			27.4800	1.1450	31.4656		(27)
North Roof Windows			1.9200	1.1450	2.1985		(27a)
Ground Floor			86.2400	0.1300	11.2112	110.0000	9486.4000 (28a)
External Wall 1	206.1200	30.3200	175.8000	0.1600	28.1280	60.0000	10548.0000 (29a)
Main Roof	99.9600	1.9200	98.0400	0.1300	12.7452	9.0000	882.3600 (30)
Total net area of external elements Aum(A, m2)			392.3200				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 88.5885		(33)
Stud Walls			299.3600			9.0000	2694.2400 (32c)
Internal Floor			86.2400			18.0000	1552.3200 (32d)
Internal Floor 2			40.1800			18.0000	723.2400 (32d)
Internal Ceiling			86.2400			9.0000	776.1600 (32e)
Internal Ceiling 2			86.2400			9.0000	776.1600 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 27438.8800 (34)
 Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 129.0270 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	20.9500	0.0210	0.4400
E3 Sill	19.6000	0.0270	0.5292
E4 Jamb	38.4000	0.0410	1.5744
E5 Ground floor (normal)	37.2000	0.0560	2.0832
E6 Intermediate floor within a dwelling	65.0000	0.0100	0.6500
E16 Corner (normal)	26.0000	0.0000	0.0000
E11 Eaves (insulation at rafter level)	19.6000	0.1500	2.9400
E13 Gable (insulation at rafter level)	20.4000	0.0530	1.0812
R1 Head of roof window	2.4000	0.2400	0.5760
R2 Sill of roof window	2.4000	0.2400	0.5760
R3 Jamb of roof window	6.4000	0.2400	1.5360

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 11.9860 (36)
 Point Thermal bridges (36a) = 0.0000
 Total fabric heat loss (33) + (36) + (36a) = 100.5745 (37)

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

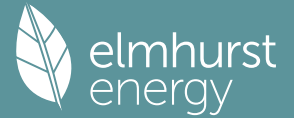
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	93.4883	92.4571	92.1299	91.1980	91.5003	90.3407	90.3407	89.8105	89.8105	90.6182	90.6182	91.8110 (38)
Average = Sum(39)m / 12 =	194.0628	193.0315	192.7043	191.7725	192.0748	190.9151	190.9151	190.3850	190.3850	191.1926	191.1926	192.3854 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.9125	0.9077	0.9062	0.9018	0.9032	0.8977	0.8977	0.8953	0.8953	0.8991	0.8991	0.9047 (40)
HLP (average)												0.9017
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy	3.0184 (42)											
Hot water usage for mixer showers	102.8889	101.3427	99.0895	94.7785	91.5971	88.0493	86.0327	88.2687	90.7199	94.5293	98.9328	102.4947 (42a)
Hot water usage for baths	32.3018	31.8221	31.1465	29.9009	28.9682	27.9340	27.3754	28.0462	28.7766	29.8833	31.1545	32.1926 (42b)
Hot water usage for other uses	45.5413	43.8852	42.2292	40.5732	38.9171	37.2611	37.2611	38.9171	40.5732	42.2292	43.8852	45.5413 (42c)
Average daily hot water use (litres/day)												166.2102 (43)
Daily hot water use	180.7320	177.0500	172.4653	165.2526	159.4825	153.2444	150.6691	155.2321	160.0697	166.6417	173.9726	180.2286 (44)

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Energy content (annual)	286.2353	252.1169	265.0727	226.2226	214.6941	188.4318	182.2212	192.2098	197.3820	226.1313	247.8559	282.1944 (45)
Energy content (annual)	Total = Sum(45)m =											2760.7679
Distribution loss (46)m = 0.15 x (45)m	42.9353	37.8175	39.7609	33.9334	32.2041	28.2648	27.3332	28.8315	29.6073	33.9197	37.1784	42.3292 (46)
Water storage loss:												210.0000 (47)
Store volume												2.3000 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												1.2420 (55)
Enter (49) or (54) in (55)												1.2420 (55)
Total storage loss	38.5020	34.7760	38.5020	37.2600	38.5020	37.2600	38.5020	38.5020	37.2600	38.5020	37.2600	38.5020 (56)
If cylinder contains dedicated solar storage	38.5020	34.7760	38.5020	37.2600	38.5020	37.2600	38.5020	38.5020	37.2600	38.5020	37.2600	38.5020 (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	347.9997	307.9041	326.8371	285.9946	276.4585	248.2038	243.9856	253.9742	257.1540	287.8957	307.6279	343.9588 (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	347.9997	307.9041	326.8371	285.9946	276.4585	248.2038	243.9856	253.9742	257.1540	287.8957	307.6279	343.9588 (64)
	Total per year (kWh/year) = Sum(64)m =											3487.9939 (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	144.5848	128.4586	137.5482	123.0366	120.7973	110.4712	110.0001	113.3213	113.4471	124.6002	130.2297	143.2412 (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	181.1032	181.1032	181.1032	181.1032	181.1032	181.1032	181.1032	181.1032	181.1032	181.1032	181.1032	181.1032 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	62.8912	55.8594	45.4279	34.3918	25.7083	21.7040	23.4520	30.4838	40.9152	51.9513	60.6348	64.6391 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	571.5281	577.4588	562.5137	530.6973	490.5349	452.7879	427.5705	421.6398	436.5850	468.4013	508.5638	546.3108 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	56.1287	56.1287	56.1287	56.1287	56.1287	56.1287	56.1287	56.1287	56.1287	56.1287	56.1287	56.1287 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-120.7354	-120.7354	-120.7354	-120.7354	-120.7354	-120.7354	-120.7354	-120.7354	-120.7354	-120.7354	-120.7354	-120.7354 (71)
Water heating gains (Table 5)	194.3344	191.1587	184.8766	170.8842	162.3620	153.4322	147.8496	152.3135	157.5654	167.4733	180.8746	192.5285 (72)
Total internal gains	948.2501	943.9733	912.3146	855.4698	798.1016	744.4205	715.3685	720.9336	751.5621	807.3224	869.5696	922.9748 (73)

6. Solar gains

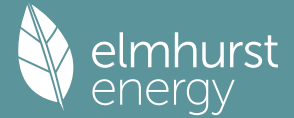
[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
North	16.3800	13.1177	0.7600	0.7000	0.7700	79.2164 (74)
South	9.8400	55.4171	0.7600	0.7000	0.7700	201.0407 (78)
West	1.2600	24.4891	0.7600	0.7000	0.7700	11.3760 (80)
North	1.9200	33.0000	0.7600	0.7000	1.0000	30.3368 (82)

Solar gains	321.9699	488.2733	704.3259	974.4692	1136.0274	1247.4343	1164.9847	1022.0851	847.2653	589.7819	380.6630	266.8452 (83)
Total gains	1270.2199	1432.2466	1616.6406	1829.9390	1934.1289	1991.8548	1880.3532	1743.0187	1598.8273	1397.1043	1250.2326	1189.8199 (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)	39.2755	39.4853	39.5524	39.7446	39.6820	39.9230	39.9230	40.0342	40.0342	39.8651	39.8651	39.6179
tau	3.6184	3.6324	3.6368	3.6496	3.6455	3.6615	3.6615	3.6689	3.6689	3.6577	3.6577	3.6412
util living area	0.9780	0.9655	0.9314	0.8542	0.7190	0.5175	0.3691	0.4151	0.6761	0.8861	0.9623	0.9819 (86)
MIT	19.6373	19.8032	20.1287	20.4786	20.7430	20.8778	20.9076	20.9034	20.8123	20.4827	20.0046	19.6040 (87)
Th 2	20.1568	20.1610	20.1623	20.1660	20.1648	20.1694	20.1694	20.1715	20.1715	20.1683	20.1683	20.1635 (88)
util rest of house	0.9743	0.9597	0.9196	0.8296	0.6735	0.4510	0.2891	0.3314	0.6135	0.8610	0.9549	0.9788 (89)
MIT 2	18.5425	18.7552	19.1648	19.5943	19.8963	20.0348	20.0578	20.0577	19.9797	19.6097	19.0180	18.5053 (90)
Living area fraction	18.6687	18.8760	19.2759	19.6962	19.9939	20.1319	20.1557	20.1551	20.0757	19.7103	19.1317	18.6319 (92)
MIT	18.6687	18.8760	19.2759	19.6962	19.9939	20.1319	20.1557	20.1551	20.0757	19.7103	19.1317	18.6319 (93)
Temperature adjustment												0.0000
adjusted MIT	18.6687	18.8760	19.2759	19.6962	19.9939	20.1319	20.1557	20.1551	20.0757	19.7103	19.1317	18.6319 (93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9654	0.9483	0.9043	0.8137	0.6634	0.4479	0.2877	0.3297	0.6057	0.8446	0.9428	0.9710	(94)
Useful gains	1226.3209	1358.2171	1461.9777	1489.0643	1283.0842	892.0838	541.0261	574.7016	968.3773	1179.9830	1178.7529	1155.3594	(95)
Ext temp.	4.6000	5.1000	7.0000	9.4000	12.4000	15.3000	17.3000	17.1000	14.5000	11.1000	7.5000	4.6000	(96)
Heat loss rate W	2730.2074	2659.1990	2365.6133	1974.5273	1458.5966	922.4906	545.1991	581.6545	1061.5275	1646.2301	2223.8939	2699.5383	(97)
Space heating kWh	1118.8915	874.2598	672.3049	349.5334	130.5813	0.0000	0.0000	0.0000	0.0000	346.8879	752.5015	1148.8691	(98a)
Space heating requirement - total per year (kWh/year)												5393.8294	
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	1118.8915	874.2598	672.3049	349.5334	130.5813	0.0000	0.0000	0.0000	0.0000	346.8879	752.5015	1148.8691	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												5393.8294	
Space heating per m2													(98c) / (4) = 25.3636 (99)

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

Fraction of space heat from secondary/supplementary system (Table 1)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													170.0000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	1118.8915	874.2598	672.3049	349.5334	130.5813	0.0000	0.0000	0.0000	0.0000	346.8879	752.5015	1148.8691	(98)
Space heating efficiency (main heating system 1)	170.0000	170.0000	170.0000	170.0000	170.0000	0.0000	0.0000	0.0000	0.0000	170.0000	170.0000	170.0000	(210)
Space heating fuel (main heating system)	658.1715	514.2705	395.4735	205.6079	76.8125	0.0000	0.0000	0.0000	0.0000	204.0517	442.6480	675.8054	(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	347.9997	307.9041	326.8371	285.9946	276.4585	248.2038	243.9856	253.9742	257.1540	287.8957	307.6279	343.9588	(64)
Efficiency of water heater	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	(216)
Fuel for water heating, kWh/month	204.7057	181.1200	192.2571	168.2321	162.6226	146.0022	143.5210	149.3966	151.2670	169.3504	180.9576	202.3287	(219)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(231)
Lighting	55.0483	44.1618	39.7628	29.1319	22.5023	18.3846	20.5274	26.6823	34.6576	45.4727	51.3613	56.5782	(232)
Electricity generated by PVs (Appendix M) (negative quantity)	-26.4750	-36.3849	-57.1202	-71.1175	-78.5293	-77.1782	-75.0803	-68.8093	-57.9412	-45.8342	-29.7413	-21.9159	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)	-4.2200	-7.8238	-17.2261	-30.5281	-43.1254	-51.0968	-49.1670	-41.2696	-29.7316	-14.6231	-5.9211	-3.1274	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1													3172.8408 (211)
Space heating fuel - main system 2													0.0000 (213)
Space heating fuel - secondary													0.0000 (215)
Efficiency of water heater													170.0000
Water heating fuel used													2051.7611 (219)
Space cooling fuel													0.0000 (221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year													0.0000 (231)
Electricity for lighting (calculated in Appendix L)													444.2711 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation													-943.9872 (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													4724.8859 (238)

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10a. Fuel costs - using BEDF prices (511)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	3172.8408	18.3900	583.4854 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2051.7611	18.3900	377.3189 (247)
Energy for instantaneous electric shower(s)	0.0000	18.3900	0.0000 (247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (249)
Energy for lighting	444.2711	18.3900	81.7015 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-646.1273	18.3900	-118.8228
PV Unit electricity exported	-297.8599	5.8100	-17.3057
Total			-136.1285 (252)
Total energy cost			906.3773 (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	3172.8408	0.1558	494.3610 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2051.7611	0.1410	289.2589 (264)
Space and water heating			783.6199 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	444.2711	0.1443	64.1221 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-646.1273	0.1332	-86.0795
PV Unit electricity exported	-297.8599	0.1217	-36.2451
Total			-122.3246 (269)
Total CO2, kg/year			725.4173 (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	3172.8408	1.5768	5003.0573 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2051.7611	1.5213	3121.3442 (278)
Space and water heating			8124.4015 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	444.2711	1.5338	681.4379 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-646.1273	1.4923	-964.2075
PV Unit electricity exported	-297.8599	0.4464	-132.9503
Total			-1097.1577 (283)
Total Primary energy kWh/year			7708.6816 (286)

SAP 10 EPC IMPROVEMENTS

Poyle Road Plot 1 - ASHP

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

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

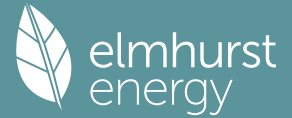
Recommended measures:
 N Solar water heating SAP change + 1.2 Cost change -£ 71 CO2 change -49 kg (6.7%)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
Solar water heating	£71	0.23 kg/m ²	B 81 A 96
Total Savings	£71	0.23 kg/m²	

Potential energy efficiency rating: B 81
 Potential environmental impact rating: A 96

Fuel prices for cost data on this page from database revision number 511 TEST (31 Jan 2023)

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Recommendation texts revision number 6.1 (11 Jun 2019)

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

	Current £1043	Potential £970	Saving £72
Electricity			
Space heating	£583	£599	-£15
Water heating	£377	£290	£88
Lighting	£82	£82	£0
Generated (PV)	-£136	-£135	-£2
Total cost of fuels	£907	£835	£70
Total cost of uses	£906	£836	£71
Delivered energy	22 kWh/m ²	20 kWh/m ²	2 kWh/m ²
Carbon dioxide emissions	0.7 tonnes	0.7 tonnes	0.0 tonnes
CO2 emissions per m ²	3 kg/m ²	3 kg/m ²	0 kg/m ²
Primary energy	36 kWh/m ²	34 kWh/m ²	3 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	86.2400 (1b)	x 2.4000 (2b)	= 206.9760 (1b) -
First floor	86.2400 (1c)	x 2.7000 (2c)	= 232.8480 (1c) -
Second floor	40.1800 (1d)	x 2.0000 (2d)	= 80.3600 (1d) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	212.6600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	520.1840 (5)

2. Ventilation rate

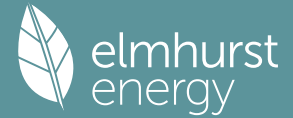
		m ³ per hour
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	4 * 10 =	40.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.0769 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3269 (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) =	0.2779 (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	0.3543	0.3473	0.3404	0.3056	0.2987	0.2640	0.2640	0.2570	0.2779	0.2987	0.3126	0.3265 (22b)
Effective ac	0.5628	0.5603	0.5579	0.5467	0.5446	0.5348	0.5348	0.5330	0.5386	0.5446	0.5489	0.5533 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Entrance Door			2.8400	1.0000	2.8400		(26a)
Windows (Uw = 1.20)			27.4800	1.1450	31.4656		(27)
North Roof Windows			1.9200	1.1450	2.1985		(27a)
Ground Floor			86.2400	0.1300	11.2112	110.0000	9486.4000 (28a)
External Wall 1	206.1200	30.3200	175.8000	0.1600	28.1280	60.0000	10548.0000 (29a)
Main Roof	99.9600	1.9200	98.0400	0.1300	12.7452	9.0000	882.3600 (30)

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Total net area of external elements Aum(A, m2)	392.3200			(31)
Fabric heat loss, W/K = Sum (A x U)	(26)...(30) + (32) =	88.5885		(33)
Stud Walls	299.3600		9.0000	2694.2400 (32c)
Internal Floor	86.2400		18.0000	1552.3200 (32d)
Internal Floor 2	40.1800		18.0000	723.2400 (32d)
Internal Ceiling	86.2400		9.0000	776.1600 (32e)
Internal Ceiling 2	86.2400		9.0000	776.1600 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 27438.8800 (34)
 Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 129.0270 (35)

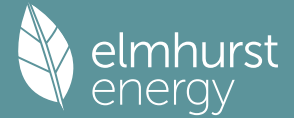
List of Thermal Bridges			
K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	20.9500	0.0210	0.4400
E3 Sill	19.6000	0.0270	0.5292
E4 Jamb	38.4000	0.0410	1.5744
E5 Ground floor (normal)	37.2000	0.0560	2.0832
E6 Intermediate floor within a dwelling	65.0000	0.0100	0.6500
E16 Corner (normal)	26.0000	0.0000	0.0000
E11 Eaves (insulation at rafter level)	19.6000	0.1500	2.9400
E13 Gable (insulation at rafter level)	20.4000	0.0530	1.0812
R1 Head of roof window	2.4000	0.2400	0.5760
R2 Sill of roof window	2.4000	0.2400	0.5760
R3 Jamb of roof window	6.4000	0.2400	1.5360
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			11.9860 (36)
Point Thermal bridges			(36a) = 0.0000
Total fabric heat loss			(33) + (36) + (36a) = 100.5745 (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	96.6029	96.1846	95.7746	93.8487	93.4883	91.8110	91.8110	91.5003	92.4571	93.4883	94.2173	94.9794 (38)
Average = Sum(39)m / 12 =	197.1774	196.7591	196.3490	194.4231	194.0628	192.3854	192.3854	192.0748	193.0315	194.0628	194.7918	195.5538 (39)
	197.1774	196.7591	196.3490	194.4231	194.0628	192.3854	192.3854	192.0748	193.0315	194.0628	194.7918	195.5538 (39)
HLP	0.9272	0.9252	0.9233	0.9142	0.9125	0.9047	0.9047	0.9032	0.9077	0.9125	0.9160	0.9196 (40)
HLP (average)												0.9142
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy													3.0184 (42)
Hot water usage for mixer showers	102.8889	101.3427	99.0895	94.7785	91.5971	88.0493	86.0327	88.2687	90.7199	94.5293	98.9328	102.4947	102.4947 (42a)
Hot water usage for baths	32.3018	31.8221	31.1465	29.9009	28.9682	27.9340	27.3754	28.0462	28.7766	29.8833	31.1545	32.1926	32.1926 (42b)
Hot water usage for other uses	45.5413	43.8852	42.2292	40.5732	38.9171	37.2611	37.2611	38.9171	40.5732	42.2292	43.8852	45.5413	45.5413 (42c)
Average daily hot water use (litres/day)	167.7416	166.2670	166.2670	166.2670	166.2670	166.2670	166.2670	166.2670	166.2670	166.2670	166.2670	166.2670	166.2102 (43)
Daily hot water use	180.7320	177.0500	172.4653	165.2526	159.4825	153.2444	150.6691	155.2321	160.0697	166.6417	173.9726	180.2286	180.2286 (44)
Energy conte	286.2353	252.1169	265.0727	226.2226	214.6941	188.4318	182.2212	192.2098	197.3820	226.1313	247.8559	282.1944	282.1944 (45)
Energy content (annual)													Total = Sum(45)m = 2760.7679
Distribution loss (46)m = 0.15 x (45)m	42.9353	37.8175	39.7609	33.9334	32.2041	28.2648	27.3332	28.8315	29.6073	33.9197	37.1784	42.3292	42.3292 (46)
Water storage loss:													
Store volume													210.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													2.3000 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													1.2420 (55)
Total storage loss	38.5020	34.7760	38.5020	37.2600	38.5020	37.2600	38.5020	38.5020	37.2600	38.5020	37.2600	38.5020	38.5020 (56)
If cylinder contains dedicated solar storage	38.5020	34.7760	38.5020	37.2600	38.5020	37.2600	38.5020	38.5020	37.2600	38.5020	37.2600	38.5020	38.5020 (57)
Primary loss	23.2624	21.0112	21.8667	15.7584	10.4681	9.9053	10.2355	11.1660	17.1091	21.8667	22.5120	23.2624	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	0.0000 (61)
Total heat required for water heating calculated for each month	347.9997	307.9041	325.4413	279.2410	263.6642	235.5971	230.9587	241.8777	251.7511	286.4999	307.6279	343.9588	343.9588 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)
Aperture area of solar collector													3.0000 (H1)
Zero-loss collector efficiency													0.8000 (H2)
Collector linear heat loss coefficient													1.8000 (H3)
Collector 2nd order heat loss coefficient													0.0000 (H4)
Collector loop efficiency													0.9000 (H5)
Incidence angle modifier													1.0000 (H6)
Overshading factor													0.8000 (H8)
Overall heat loss coefficient of system													6.5000 (H10)
Heat loss coefficient of collector loop													3.9667 (H11)
Dedicated solar storage volume													75.0000 (H12)
Effective solar volume													75.0000 (H14)
Reference volume													225.0000 (H15)
Storage tank correction coefficient													1.3161 (H16)
Heat delivered to hot water													654.8932 (H24)
Heat delivered to space heating													0.0000 (H29)
Solar input													654.8932
Solar input	-0.0000	-16.1630	-59.9659	-83.8557	-111.5654	-103.2155	-102.6584	-88.6316	-59.9216	-28.9160	-0.0000	-0.0000	-0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h													

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	347.9997	291.7411	265.4755	195.3852	152.0987	132.3815	128.3003	153.2461	191.8295	257.5839	307.6279	343.9588 (64)
Electric shower(s)	Total per year (kWh/year) = Sum(64)m =											2767.6283 (64)
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
	Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =											0.0000 (64a)
Heat gains from water heating, kWh/month	144.5848	128.4586	136.4316	117.6337	110.5618	100.3858	99.5785	103.6441	109.1248	123.4836	130.2297	143.2412 (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	181.1032	181.1032	181.1032	181.1032	181.1032	181.1032	181.1032	181.1032	181.1032	181.1032	181.1032	181.1032 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	62.8912	55.8594	45.4279	34.3918	25.7083	21.7040	23.4520	30.4838	40.9152	51.9513	60.6348	64.6391 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	571.5281	577.4588	562.5137	530.6973	490.5349	452.7879	427.5705	421.6398	436.5850	468.4013	508.5638	546.3108 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	56.1287	56.1287	56.1287	56.1287	56.1287	56.1287	56.1287	56.1287	56.1287	56.1287	56.1287	56.1287 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-120.7354	-120.7354	-120.7354	-120.7354	-120.7354	-120.7354	-120.7354	-120.7354	-120.7354	-120.7354	-120.7354	-120.7354 (71)
Water heating gains (Table 5)	194.3344	191.1587	183.3758	163.3802	148.6046	139.4247	133.8421	139.3066	151.5622	165.9725	180.8746	192.5285 (72)
Total internal gains	948.2501	943.9733	910.8138	847.9658	784.3442	730.4130	701.3610	707.9266	745.5589	805.8216	869.5696	922.9748 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	Access factor Table 6d	Gains W						
North	16.3800	10.6334	0.7600	0.7000	0.7700	64.2141 (74)						
South	9.8400	46.7521	0.7600	0.7000	0.7700	169.6058 (78)						
West	1.2600	19.6403	0.7600	0.7000	0.7700	9.1235 (80)						
North	1.9200	26.0000	0.7600	0.7000	1.0000	23.9017 (82)						
Solar gains	266.8452	467.9767	680.0006	915.6118	1096.9678	1121.7052	1067.7548	926.6263	760.2363	527.5308	321.9699	226.8951 (83)
Total gains	1215.0953	1411.9499	1590.8144	1763.5776	1881.3120	1852.1183	1769.1158	1634.5530	1505.7952	1333.3524	1191.5395	1149.8698 (84)

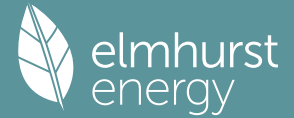
7. Mean internal temperature (heating season)

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, n1,m (see Table 9a)												21.0000 (85)
tau	38.6551	38.7373	38.8182	39.2027	39.2755	39.6179	39.6179	39.6820	39.4853	39.2755	39.1285	38.9760
alpha	3.5770	3.5825	3.5879	3.6135	3.6184	3.6412	3.6412	3.6455	3.6324	3.6184	3.6086	3.5984
util living area	0.9820	0.9686	0.9413	0.8798	0.7669	0.6055	0.4609	0.5126	0.7337	0.9112	0.9704	0.9850 (86)
MIT	19.5378	19.7335	20.0285	20.3877	20.6765	20.8428	20.8948	20.8852	20.7654	20.3859	19.8943	19.5002 (87)
Th 2	20.1444	20.1461	20.1477	20.1554	20.1568	20.1635	20.1635	20.1648	20.1610	20.1568	20.1539	20.1509 (88)
util rest of house	0.9789	0.9633	0.9311	0.8588	0.7271	0.5420	0.3799	0.4295	0.6764	0.8911	0.9644	0.9824 (89)
MIT 2	18.4069	18.6560	19.0285	19.4771	19.8167	19.9985	20.0435	20.0384	19.9240	19.4845	18.8682	18.3638 (90)
Living area fraction	fLA = Living area / (4) =											0.1153 (91)
MIT	18.5373	18.7802	19.1437	19.5821	19.9158	20.0958	20.1416	20.1360	20.0210	19.5884	18.9865	18.4948 (92)
Temperature adjustment												0.0000
adjusted MIT	18.5373	18.7802	19.1437	19.5821	19.9158	20.0958	20.1416	20.1360	20.0210	19.5884	18.9865	18.4948 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9710	0.9522	0.9164	0.8423	0.7146	0.5365	0.3777	0.4265	0.6659	0.8746	0.9537	0.9755 (94)
Useful gains	1179.8614	1344.4957	1457.8112	1485.4125	1344.3146	993.6757	668.2174	697.1231	1002.6564	1166.1828	1136.3464	1121.7099 (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	2807.2659	2731.0454	2482.5838	2076.8416	1594.3828	1057.3192	681.3550	717.5915	1142.9334	1744.3125	2315.3919	2795.4050 (97)
Space heating kWh	1210.7890	931.7614	762.4308	425.8290	186.0507	0.0000	0.0000	0.0000	0.0000	430.1286	848.9128	1245.2291 (98a)
Space heating requirement - total per year (kWh/year)												6041.1314
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	1210.7890	931.7614	762.4308	425.8290	186.0507	0.0000	0.0000	0.0000	0.0000	430.1286	848.9128	1245.2291 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												6041.1314
Space heating per m2												(98c) / (4) = 28.4075 (99)

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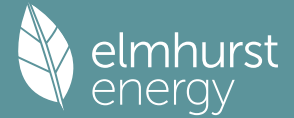
9a. Energy requirements - Individual heating systems, including micro-CHP

	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 %)													170.0000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement	1210.7890	931.7614	762.4308	425.8290	186.0507	0.0000	0.0000	0.0000	0.0000	430.1286	848.9128	1245.2291	(98)
Space heating efficiency (main heating system 1)	170.0000	170.0000	170.0000	170.0000	170.0000	0.0000	0.0000	0.0000	0.0000	170.0000	170.0000	170.0000	(210)
Space heating fuel (main heating system)	712.2288	548.0949	448.4887	250.4876	109.4416	0.0000	0.0000	0.0000	0.0000	253.0168	499.3605	732.4877	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	347.9997	291.7411	265.4755	195.3852	152.0987	132.3815	128.3003	153.2461	191.8295	257.5839	307.6279	343.9588	(64)
Efficiency of water heater (217)m	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	(216)
Fuel for water heating, kWh/month	204.7057	171.6124	156.1621	114.9325	89.4698	77.8715	75.4708	90.1447	112.8409	151.5199	180.9576	202.3287	(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	6.7945	6.1370	6.7945	6.5753	6.7945	6.5753	6.7945	6.7945	6.5753	6.7945	6.5753	6.7945	(231)
Lighting	55.0483	44.1618	39.7628	29.1319	22.5023	18.3846	20.5274	26.6823	34.6576	45.4727	51.3613	56.5782	(232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-21.9827	-34.6720	-55.1598	-67.4766	-75.6958	-69.2135	-68.2410	-62.2630	-52.2506	-41.4496	-25.2992	-18.6061	(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	-3.0606	-7.1180	-16.0134	-27.9094	-42.1456	-46.6434	-46.0847	-37.6240	-25.9809	-11.9733	-4.4057	-2.3508	(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													3553.6067 (211)
Space heating fuel - main system 2													0.0000 (213)
Space heating fuel - secondary													0.0000 (215)
Efficiency of water heater													170.0000
Water heating fuel used													1628.0167 (219)
Space cooling fuel													0.0000 (221)
Electricity for pumps and fans:													
pump for solar water heating													80.0000 (230g)
Total electricity for the above, kWh/year													80.0000 (231)
Electricity for lighting (calculated in Appendix L)													444.2711 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation													-863.6197 (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													4842.2748 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	3553.6067	16.4900	585.9897 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1628.0167	16.4900	268.4599 (247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000 (247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (249)
Pump for solar water heating	80.0000	16.4900	13.1920 (249)
Energy for lighting	444.2711	16.4900	73.2603 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-592.3099	16.4900	-97.6719
PV Unit electricity exported	-271.3098	5.5900	-15.1662
Total			-112.8381 (252)

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Total energy cost

828.0639 (255)

 11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	1.1570 (257)
SAP value		81.2456
SAP rating (Section 12)		B (258)
SAP band		B

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	3553.6067	0.1553	551.8825 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1628.0167	0.1446	235.4587 (264)
Space and water heating			787.3412 (265)
Pumps, fans and electric keep-hot	80.0000	0.1387	11.0970 (267)
Energy for lighting	444.2711	0.1443	64.1221 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-592.3099	0.1333	-78.9297
PV Unit electricity exported	-271.3098	0.1211	-32.8625
Total			-111.7921 (269)
Total CO2, kg/year			750.7681 (272)
CO2 emissions per m2			3.5300 (273)
EI value			96.0955
EI rating			96 (274)
EI band			A

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

 1. Overall dwelling characteristics

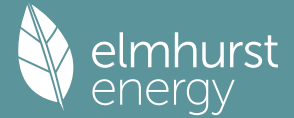
	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	86.2400 (1b)	x 2.4000 (2b)	= 206.9760 (1b) -
First floor	86.2400 (1c)	x 2.7000 (2c)	= 232.8480 (1c) -
Second floor	40.1800 (1d)	x 2.0000 (2d)	= 80.3600 (1d) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	212.6600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	520.1840 (5)

 2. Ventilation rate

		m3 per hour
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	4 * 10 =	40.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.0769 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3269 (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) =	0.2779 (21)

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	4.3000	4.0000	3.9000	3.6000	3.7000	3.3000	3.3000	3.1000	3.1000	3.4000	3.4000	3.8000 (22)

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Wind factor	1.0750	1.0000	0.9750	0.9000	0.9250	0.8250	0.8250	0.7750	0.7750	0.8500	0.8500	0.9500 (22a)
Adj infilt rate	0.2987	0.2779	0.2709	0.2501	0.2570	0.2292	0.2292	0.2153	0.2153	0.2362	0.2362	0.2640 (22b)
Effective ac	0.5446	0.5386	0.5367	0.5313	0.5330	0.5263	0.5263	0.5232	0.5232	0.5279	0.5279	0.5348 (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
Entrance Door			2.8400	1.0000	2.8400		(26a)
Windows (Uw = 1.20)			27.4800	1.1450	31.4656		(27)
North Roof Windows			1.9200	1.1450	2.1985		(27a)
Ground Floor			86.2400	0.1300	11.2112	110.0000	9486.4000 (28a)
External Wall 1	206.1200	30.3200	175.8000	0.1600	28.1280	60.0000	10548.0000 (29a)
Main Roof	99.9600	1.9200	98.0400	0.1300	12.7452	9.0000	882.3600 (30)
Total net area of external elements Aum(A, m2)			392.3200				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 88.5885		(33)
Stud Walls			299.3600			9.0000	2694.2400 (32c)
Internal Floor			86.2400			18.0000	1552.3200 (32d)
Internal Floor 2			40.1800			18.0000	723.2400 (32d)
Internal Ceiling			86.2400			9.0000	776.1600 (32e)
Internal Ceiling 2			86.2400			9.0000	776.1600 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 27438.8800 (34)
 Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 129.0270 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	20.9500	0.0210	0.4400
E3 Sill	19.6000	0.0270	0.5292
E4 Jamb	38.4000	0.0410	1.5744
E5 Ground floor (normal)	37.2000	0.0560	2.0832
E6 Intermediate floor within a dwelling	65.0000	0.0100	0.6500
E16 Corner (normal)	26.0000	0.0000	0.0000
E11 Eaves (insulation at rafter level)	19.6000	0.1500	2.9400
E13 Gable (insulation at rafter level)	20.4000	0.0530	1.0812
R1 Head of roof window	2.4000	0.2400	0.5760
R2 Sill of roof window	2.4000	0.2400	0.5760
R3 Jamb of roof window	6.4000	0.2400	1.5360

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 11.9860 (36)
 Point Thermal bridges (36a) = 0.0000
 Total fabric heat loss (33) + (36) + (36a) = 100.5745 (37)

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

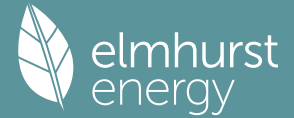
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	93.4883	92.4571	92.1299	91.1980	91.5003	90.3407	90.3407	89.8105	89.8105	90.6182	90.6182	91.8110 (38)
Heat transfer coeff	194.0628	193.0315	192.7043	191.7725	192.0748	190.9151	190.9151	190.3850	190.3850	191.1926	191.1926	192.3854 (39)
Average = Sum(39)m / 12 =												191.7514

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.9125	0.9077	0.9062	0.9018	0.9032	0.8977	0.8977	0.8953	0.8953	0.8991	0.8991	0.9047 (40)
HLP (average)												0.9017
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy													3.0184 (42)
Hot water usage for mixer showers													102.4947 (42a)
Hot water usage for baths													32.1926 (42b)
Hot water usage for other uses													45.5413 (42c)
Average daily hot water use (litres/day)													166.2102 (43)
Daily hot water use													
Energy conte	180.7320	177.0500	172.4653	165.2526	159.4825	153.2444	150.6691	155.2321	160.0697	166.6417	173.9726	180.2286 (44)	
Energy content (annual)	286.2353	252.1169	265.0727	226.2226	214.6941	188.4318	182.2212	192.2098	197.3820	226.1313	247.8559	282.1944 (45)	
Distribution loss (46)m = 0.15 x (45)m													2760.7679
Water storage loss:													
Store volume													210.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													2.3000 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													1.2420 (55)
Total storage loss													38.5020 (56)
If cylinder contains dedicated solar storage													
Primary loss	38.5020	34.7760	38.5020	37.2600	38.5020	37.2600	38.5020	38.5020	37.2600	38.5020	37.2600	38.5020 (57)	
Combi loss	23.2624	21.0112	21.8667	15.7584	10.4681	9.9053	10.2355	11.1660	17.1091	21.8667	22.5120	23.2624 (59)	
Total heat required for water heating calculated for each month	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)	
WWHRS	347.9997	307.9041	325.4413	279.2410	263.6642	235.5971	230.9587	241.8777	251.7511	286.4999	307.6279	343.9588 (62)	
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 (63a)	
	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)	

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Aperture area of solar collector																		3.0000 (H1)
Zero-loss collector efficiency																		0.8000 (H2)
Collector linear heat loss coefficient																		1.8000 (H3)
Collector 2nd order heat loss coefficient																		0.0000 (H4)
Collector loop efficiency																		0.9000 (H5)
Incidence angle modifier																		1.0000 (H6)
Overshading factor																		0.8000 (H8)
Overall heat loss coefficient of system																		6.5000 (H10)
Heat loss coefficient of collector loop																		3.9667 (H11)
Dedicated solar storage volume																		75.0000 (H12)
Effective solar volume																		75.0000 (H14)
Reference volume																		225.0000 (H15)
Storage tank correction coefficient																		1.3161 (H16)
Heat delivered to hot water																		744.2794 (H24)
Heat delivered to space heating																		0.0000 (H29)
Solar input																		744.2794
Solar input	-1.0195	-19.6854	-65.0423	-92.0825	-116.7938	-117.1272	-114.1549	-101.2854	-72.0873	-39.5081	-5.4930							-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	346.9803	288.2187	260.3990	187.1585	146.8704	118.4699	116.8038	140.5923	179.6638	246.9918	302.1349							343.9588 (64)
																		Total per year (kWh/year) = Sum(64)m = 2678.2422 (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	144.5848	128.4586	136.4316	117.6337	110.5618	100.3858	99.5785	103.6441	109.1248	123.4836	130.2297							143.2412 (65)

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

Metabolic gains (Table 5), Watts																		
(66)m	181.1032	181.1032	181.1032	181.1032	181.1032	181.1032	181.1032	181.1032	181.1032	181.1032	181.1032	181.1032	181.1032	181.1032	181.1032	181.1032	181.1032	181.1032 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	62.8912	55.8594	45.4279	34.3918	25.7083	21.7040	23.4520	30.4838	40.9152	51.9513	60.6348	64.6391	64.6391	64.6391	64.6391	64.6391	64.6391	64.6391 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	571.5281	577.4588	562.5137	530.6973	490.5349	452.7879	427.5705	421.6398	436.5850	468.4013	508.5638	546.3108	546.3108	546.3108	546.3108	546.3108	546.3108	546.3108 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	56.1287	56.1287	56.1287	56.1287	56.1287	56.1287	56.1287	56.1287	56.1287	56.1287	56.1287	56.1287	56.1287	56.1287	56.1287	56.1287	56.1287	56.1287 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-120.7354	-120.7354	-120.7354	-120.7354	-120.7354	-120.7354	-120.7354	-120.7354	-120.7354	-120.7354	-120.7354	-120.7354	-120.7354	-120.7354	-120.7354	-120.7354	-120.7354	-120.7354 (71)
Water heating gains (Table 5)	194.3344	191.1587	183.3758	163.3802	148.6046	139.4247	133.8421	139.3066	151.5622	165.9725	180.8746	192.5285	192.5285	192.5285	192.5285	192.5285	192.5285	192.5285 (72)
Total internal gains	948.2501	943.9733	910.8138	847.9658	784.3442	730.4130	701.3610	707.9266	745.5589	805.8216	869.5696	922.9748	922.9748	922.9748	922.9748	922.9748	922.9748	922.9748 (73)

6. Solar gains

[Jan]		Area	Solar flux															
		m2	Table 6a	g	Specific data	Specific data	FF	Access	Gains									
			W/m2	or Table 6b	or Table 6c	Table 6d			W									
North		16.3800	13.1177	0.7600	0.7000	0.7700			79.2164 (74)									
South		9.8400	55.4171	0.7600	0.7000	0.7700			201.0407 (78)									
West		1.2600	24.4891	0.7600	0.7000	0.7700			11.3760 (80)									
North		1.9200	33.0000	0.7600	0.7000	1.0000			30.3368 (82)									

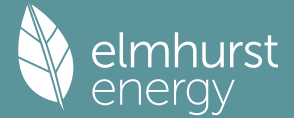
Solar gains	321.9699	488.2733	704.3259	974.4692	1136.0274	1247.4343	1164.9847	1022.0851	847.2653	589.7819	380.6630	266.8452 (83)
Total gains	1270.2199	1432.2466	1615.1398	1822.4350	1920.3716	1977.8474	1866.3457	1730.0117	1592.8241	1395.6035	1250.2326	1189.8199 (84)

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	39.2755	39.4853	39.5524	39.7446	39.6820	39.9230	39.9230	40.0342	40.0342	39.8651	39.8651	39.6179	39.6179	39.6179	39.6179	39.6179	39.6179	39.6179	39.6179 (86)
alpha	3.6184	3.6324	3.6368	3.6496	3.6455	3.6615	3.6615	3.6689	3.6689	3.6577	3.6577	3.6412	3.6412	3.6412	3.6412	3.6412	3.6412	3.6412	3.6412 (87)
util living area	0.9780	0.9655	0.9315	0.8555	0.7222	0.5206	0.3717	0.4180	0.6778	0.8863	0.9623	0.9819 (86)							
MIT	19.6373	19.8032	20.1280	20.4759	20.7404	20.8771	20.9074	20.9031	20.8114	20.4821	20.0046	19.6040 (87)							
Th 2	20.1568	20.1610	20.1623	20.1660	20.1648	20.1694	20.1694	20.1715	20.1715	20.1683	20.1683	20.1635 (88)							
util rest of house	0.9743	0.9597	0.9197	0.8310	0.6767	0.4539	0.2912	0.3338	0.6153	0.8613	0.9549	0.9788 (89)							
MIT 2	18.5425	18.7552	19.1639	19.5912	19.8937	20.0342	20.0577	20.0575	19.9789	19.6090	19.0180	18.5053 (90)							
Living area fraction	18.6687	18.8760	19.2750	19.6932	19.9913	20.1314	20.1556	20.1550	20.0749	19.7096	19.1317	18.6319 (92)							
MIT	18.6687	18.8760	19.2750	19.6932	19.9913	20.1314	20.1556	20.1550	20.0749	19.7096	19.1317	18.6319 (92)							
Temperature adjustment												0.0000							
adjusted MIT	18.6687	18.8760	19.2750	19.6932	19.9913	20.1314	20.1556	20.1550	20.0749	19.7096	19.1317	18.6319 (93)							

8. Space heating requirement

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9654	0.9483	0.9045	0.8151	0.6665	0.4507	0.2898	0.3321	0.6073	0.8449	0.9428	0.9710	(94)
Useful gains	1226.3209	1358.2171	1460.9425	1485.4844	1279.8971	891.3535	540.9042	574.5039	967.3924	1179.1697	1178.7529	1155.3594	(95)
Ext temp.	4.6000	5.1000	7.0000	9.4000	12.4000	15.3000	17.3000	17.1000	14.5000	11.1000	7.5000	4.6000	(96)
Heat loss rate W	2730.2074	2659.1990	2365.4417	1973.9445	1458.0989	922.3807	545.1798	581.6236	1061.3757	1646.0967	2223.8939	2699.5383	(97)
Space heating kWh	1118.8915	874.2598	672.9474	351.6913	132.5821	0.0000	0.0000	0.0000	0.0000	347.3937	752.5015	1148.8691	(98a)
Space heating requirement - total per year (kWh/year)												5399.1365	
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	1118.8915	874.2598	672.9474	351.6913	132.5821	0.0000	0.0000	0.0000	0.0000	347.3937	752.5015	1148.8691	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												5399.1365	
Space heating per m2												25.3886	(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 %)	170.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	1118.8915	874.2598	672.9474	351.6913	132.5821	0.0000	0.0000	0.0000	0.0000	347.3937	752.5015	1148.8691	(98)
Space heating efficiency (main heating system 1)	170.0000	170.0000	170.0000	170.0000	170.0000	0.0000	0.0000	0.0000	0.0000	170.0000	170.0000	170.0000	(210)
Space heating fuel (main heating system)	658.1715	514.2705	395.8514	206.8772	77.9895	0.0000	0.0000	0.0000	0.0000	204.3492	442.6480	675.8054	(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	346.9803	288.2187	260.3990	187.1585	146.8704	118.4699	116.8038	140.5923	179.6638	246.9918	302.1349	343.9588	(64)
Efficiency of water heater (217)m	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	(216)
Fuel for water heating, kWh/month	204.1060	169.5404	153.1759	110.0932	86.3943	69.6882	68.7081	82.7014	105.6846	145.2893	177.7264	202.3287	(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	6.7945	6.1370	6.7945	6.5753	6.7945	6.5753	6.7945	6.7945	6.5753	6.7945	6.5753	6.7945	(231)
Lighting	55.0483	44.1618	39.7628	29.1319	22.5023	18.3846	20.5274	26.6823	34.6576	45.4727	51.3613	56.5782	(232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-26.4841	-36.3676	-56.8848	-70.2695	-76.5358	-74.1698	-72.2094	-66.7046	-56.9710	-45.6921	-29.7500	-21.9233	(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	-4.2110	-7.8411	-17.4615	-31.3761	-45.1188	-54.1052	-52.0379	-43.3743	-30.7018	-14.7652	-5.9124	-3.1199	(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												3175.9627	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												170.0000	
Water heating fuel used												1575.4366	(219)
Space cooling fuel												0.0000	(221)

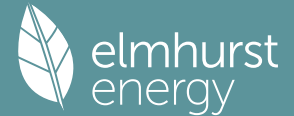
Electricity for pumps and fans:

pump for solar water heating	80.0000	(230g)
Total electricity for the above, kWh/year	80.0000	(231)
Electricity for lighting (calculated in Appendix L)	444.2711	(232)

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

PV generation	-943.9872	(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	4331.6831	(238)

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10a. Fuel costs - using BEDF prices (511)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	3175.9627	18.3900	584.0595 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1575.4366	18.3900	289.7228 (247)
Energy for instantaneous electric shower(s)	0.0000	18.3900	0.0000 (247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (249)
Pump for solar water heating	80.0000	18.3900	14.7120 (249)
Energy for lighting	444.2711	18.3900	81.7015 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-633.9620	18.3900	-116.5856
PV Unit electricity exported	-310.0252	5.8100	-18.0125
Total			-134.5981 (252)
Total energy cost			835.5977 (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	3175.9627	0.1558	494.7962 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1575.4366	0.1452	228.6999 (264)
Space and water heating			723.4961 (265)
Pumps, fans and electric keep-hot	80.0000	0.1387	11.0970 (267)
Energy for lighting	444.2711	0.1443	64.1221 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-633.9620	0.1335	-84.6072
PV Unit electricity exported	-310.0252	0.1212	-37.5769
Total			-122.1841 (269)
Total CO2, kg/year			676.5310 (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	3175.9627	1.5768	5007.7897 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1575.4366	1.5370	2421.3878 (278)
Space and water heating			7429.1775 (279)
Pumps, fans and electric keep-hot	80.0000	1.5128	121.0240 (281)
Energy for lighting	444.2711	1.5338	681.4379 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-633.9620	1.4932	-946.6125
PV Unit electricity exported	-310.0252	0.4445	-137.8213
Total			-1084.4338 (283)
Total Primary energy kWh/year			7147.2056 (286)