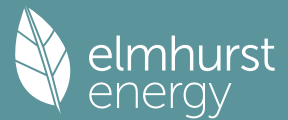


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Property Reference	Plot 2 7HR			Issued on Date	28/03/2025
Assessment Reference	Plot 2- Gas boiler	Prop Type Ref	RHS Plot		
Property	Plot 2, 7 Hawthorne Road, READING, RG4 6LY				
SAP Rating	101 A	DER	6.29	TER	7.84
Environmental	93 A	% DER < TER			19.77
CO ₂ Emissions (t/year)	0.97	DFEE	33.56	TFEE	36.41
Compliance Check	See BREL	% DFEE < TFEE			7.81
% DPER < TPER	17.46	DPER	33.96	TPER	41.14
Assessor Details	Mr. Dhiraj Karsan			Assessor ID	M078-0001
Client					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	95.1000 (1b)	x 2.4000 (2b)	= 228.2400 (1b) - (3b)
First floor	64.8000 (1c)	x 2.6000 (2c)	= 168.4800 (1c) - (3c)
Second floor	34.1000 (1d)	x 2.7000 (2d)	= 92.0700 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	194.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 488.7900 (5)

2. Ventilation rate

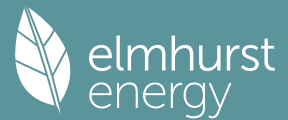
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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) = 0.0818 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3318 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3069 (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	0.3914	0.3837	0.3760	0.3376	0.3300	0.2916	0.2916	0.2839	0.3069	0.3300	0.3453	0.3607 (22b)
Effective ac	0.5766	0.5736	0.5707	0.5570	0.5544	0.5425	0.5425	0.5403	0.5471	0.5544	0.5596	0.5650 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Windows			20.1900	1.1450	23.1183		(27)
Roof Windows			8.8800	1.1450	10.1679		(27a)
Door			1.8900	1.2000	2.2680		(26)
Heat Loss Floor			95.1000	0.1100	10.4610	110.0000	10461.0000 (28a)
Cavity Wall	144.3000	22.0800	122.2200	0.1800	21.9996	60.0000	7333.2000 (29a)
Stud Wall	28.1000		28.1000	0.1100	3.0910	9.0000	252.9000 (29a)
Flat Roof	23.5000	6.0000	17.5000	0.1400	2.4500	9.0000	157.5000 (30)
Plane Roof	60.6000		60.6000	0.1132	6.8604	9.0000	545.4000 (30)
Slope Roof	13.4000	2.8800	10.5200	0.1300	1.3676	9.0000	94.6800 (30)
Total net area of external elements Aum(A, m ²)			365.0000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	81.7838		(33)
Main dwelling							
Party Wall			72.7000	0.0000	0.0000	0.0000	0.0000 (32)
Internal Wall			216.2000			9.0000	1945.8000 (32c)
Internal Ceiling			64.8000			9.0000	583.2000 (32e)
Internal Ceiling 2			34.1000			9.0000	306.9000 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	21680.5800 (34)

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

111.7556 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element	16.2000	0.0400	0.6480
E2 Other lintels (including other steel lintels)	15.3000	0.0300	0.4590
E3 Sill	33.0000	0.0300	0.9900
E4 Jamb	28.1000	0.0600	1.6860
E5 Ground floor (normal)	42.9000	0.0700	3.0030
E6 Intermediate floor within a dwelling	15.4000	0.0900	1.3860
E16 Corner (normal)	15.4000	0.0600	0.9240
E18 Party wall between dwellings	6.2000	0.0800	0.4960
R1 Head of roof window	6.2000	0.0600	0.3720
R2 Sill of roof window	11.2000	0.0800	0.8960
R3 Jamb of roof window			
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			10.8600 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	92.6438 (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	93.0028	92.5232	92.0530	89.8447	89.4315	87.5081	87.5081	87.1519	88.2489	89.4315	90.2673	91.1412 (38)
Heat transfer coeff	185.6467	185.1670	184.6968	182.4885	182.0753	180.1519	180.1519	179.7957	180.8928	182.0753	182.9112	183.7850 (39)
Average = Sum(39)m / 12 =												182.4865
HLP	0.9569	0.9545	0.9520	0.9407	0.9385	0.9286	0.9286	0.9268	0.9324	0.9385	0.9428	0.9473 (40)
HLP (average)												0.9407
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.9941 (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	85.8552	84.5801	82.7846	79.4739	76.9949	74.2460	72.7612	74.5442	76.4856	79.4270	82.8058	85.5650 (42b)
Hot water usage for other uses	45.2927	43.6457	41.9987	40.3516	38.7046	37.0576	37.0576	38.7046	40.3516	41.9987	43.6457	45.2927 (42c)
Average daily hot water use (litres/day)												120.7765 (43)
Daily hot water use	131.1479	128.2258	124.7832	119.8255	115.6995	111.3037	109.8189	113.2489	116.8373	121.4256	126.4515	130.8576 (44)
Energy conte	207.7062	182.5918	191.7872	164.0351	155.7538	136.8608	132.8164	140.2258	144.0720	164.7734	180.1533	204.8914 (45)
Energy content (annual)										Total = Sum(45)m =		2005.6673
Distribution loss (46)m = 0.15 x (45)m	31.1559	27.3888	28.7681	24.6053	23.3631	20.5291	19.9225	21.0339	21.6108	24.7160	27.0230	30.7337 (46)
Water storage loss:												
Store volume												300.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5900 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.8586 (55)
Total storage loss	26.6166	24.0408	26.6166	25.7580	26.6166	25.7580	26.6166	26.6166	25.7580	26.6166	25.7580	26.6166 (56)
If cylinder contains dedicated solar storage	26.6166	24.0408	26.6166	25.7580	26.6166	25.7580	26.6166	26.6166	25.7580	26.6166	25.7580	26.6166 (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	257.5852	227.6438	241.6662	212.3051	205.6328	185.1308	182.6954	190.1048	192.3420	214.6524	228.4233	254.7704 (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	257.5852	227.6438	241.6662	212.3051	205.6328	185.1308	182.6954	190.1048	192.3420	214.6524	228.4233	254.7704 (64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2592.9523 (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	108.9655	96.7534	103.6724	93.1577	91.6913	84.1222	84.0647	86.5283	86.5199	94.6904	98.5170	108.0296 (65)

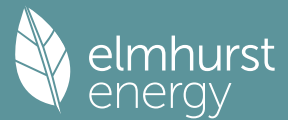
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
(66)m	149.7054	149.7054	149.7054	149.7054	149.7054	149.7054	149.7054	149.7054	149.7054	149.7054	149.7054	149.7054 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	192.4157	213.0317	192.4157	198.8295	192.4157	198.8295	192.4157	192.4157	198.8295	192.4157	198.8295	192.4157 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	365.3068	369.0975	359.5450	339.2087	313.5379	289.4109	273.2926	269.5019	279.0544	299.3906	325.0615	349.1885 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.9705	37.9705	37.9705	37.9705	37.9705	37.9705	37.9705	37.9705	37.9705	37.9705	37.9705	37.9705 (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 (70)
Losses e.g. evaporation (negative values) (Table 5)	-119.7643	-119.7643	-119.7643	-119.7643	-119.7643	-119.7643	-119.7643	-119.7643	-119.7643	-119.7643	-119.7643	-119.7643 (71)
Water heating gains (Table 5)	146.4590	143.9782	139.3447	129.3857	123.2410	116.8364	112.9901	116.3014	120.1666	127.2720	136.8291	145.2011 (72)
Total internal gains	775.0931	797.0190	762.2170	738.3356	700.1062	672.9885	646.6101	646.1306	665.9622	689.9900	731.6318	757.7169 (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
Northeast	10.6800	11.2829	0.7600	0.7000	0.7700	44.4261 (75)
Southeast	2.6400	36.7938	0.7600	0.7000	0.7700	35.8116 (77)

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Southwest			6.8700		36.7938		0.7600		0.7000		0.7700		93.1916 (79)
Northeast			2.1600		17.4137		0.7600		0.7000		1.0000		18.0094 (82)
Southwest			0.7200		38.2331		0.7600		0.7000		1.0000		13.1803 (82)
Horizontal			6.0000		26.0000		0.7600		0.7000		1.0000		74.6928 (82)

Solar gains	279.3118	527.6506	848.3491	1244.3691	1556.6759	1613.4625	1527.4988	1286.4834	985.4804	618.3474	344.2754	232.5908 (83)
Total gains	1054.4049	1324.6696	1610.5661	1982.7047	2256.7822	2286.4510	2174.1088	1932.6141	1651.4426	1308.3373	1075.9072	990.3076 (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	32.4400	32.5241	32.6069	33.0014	33.0763	33.4295	33.4295	33.4957	33.2926	33.0763	32.9252	32.7686
alpha	3.1627	3.1683	3.1738	3.2001	3.2051	3.2286	3.2286	3.2330	3.2195	3.2051	3.1950	3.1846
util living area	0.9780	0.9560	0.9098	0.8012	0.6439	0.4752	0.3556	0.4118	0.6477	0.8802	0.9620	0.9817 (86)
MIT	19.2778	19.5551	19.9491	20.4146	20.7143	20.8521	20.8892	20.8800	20.7631	20.3176	19.7141	19.2366 (87)
Th 2	20.1194	20.1214	20.1235	20.1331	20.1349	20.1432	20.1432	20.1448	20.1400	20.1349	20.1312	20.1274 (88)
util rest of house	0.9745	0.9494	0.8966	0.7744	0.6016	0.4193	0.2896	0.3408	0.5898	0.8569	0.9552	0.9788 (89)
MIT 2	18.0706	18.4226	18.9169	19.4885	19.8310	19.9803	20.0122	20.0078	19.8970	19.3881	18.6347	18.0239 (90)
Living area fraction										FLA = Living area / (4) =		0.3840 (91)
MIT	18.5342	18.8575	19.3133	19.8441	20.1702	20.3151	20.3490	20.3427	20.2296	19.7451	19.0492	18.4896 (92)
Temperature adjustment												-0.1500
adjusted MIT	18.3842	18.7075	19.1633	19.6941	20.0202	20.1651	20.1990	20.1927	20.0796	19.5951	18.8992	18.3396 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9655	0.9359	0.8793	0.7594	0.5956	0.4207	0.2940	0.3449	0.5855	0.8397	0.9427	0.9708 (94)
Useful gains	1017.9781	1239.7033	1416.1097	1505.6989	1344.1478	962.0183	639.1534	666.5248	966.8442	1098.6703	1014.2204	961.4094 (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	2614.6793	2556.6878	2338.8624	1969.7997	1514.9043	1002.5668	648.3600	681.9200	1081.6621	1637.7807	2158.2072	2598.6440 (97)
Space heating kWh	1187.9457	885.0136	686.5280	334.1526	127.0428	0.0000	0.0000	0.0000	0.0000	401.0981	823.6705	1218.1026 (98a)
Space heating requirement - total per year (kWh/year)												5663.5539
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	1187.9457	885.0136	686.5280	334.1526	127.0428	0.0000	0.0000	0.0000	0.0000	401.0981	823.6705	1218.1026 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												5663.5539
Space heating per m2										(98c) / (4) =		29.1936 (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 %)												88.8000 (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	1187.9457	885.0136	686.5280	334.1526	127.0428	0.0000	0.0000	0.0000	0.0000	401.0981	823.6705	1218.1026 (98)
Space heating efficiency (main heating system 1)	88.8000	88.8000	88.8000	88.8000	88.8000	0.0000	0.0000	0.0000	0.0000	88.8000	88.8000	88.8000 (210)
Space heating fuel (main heating system)	1337.7767	996.6369	773.1171	376.2979	143.0663	0.0000	0.0000	0.0000	0.0000	451.6871	927.5569	1371.7371 (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	257.5852	227.6438	241.6662	212.3051	205.6328	185.1308	182.6954	190.1048	192.3420	214.6524	228.4233	254.7704 (64)
Efficiency of water heater (217)m	87.0505	86.7972	86.2669	85.0724	83.0130	79.8000	79.8000	79.8000	79.8000	85.4408	86.6776	79.8000 (216)
Fuel for water heating, kWh/month	295.9030	262.2710	280.1379	249.5583	247.7116	231.9935	228.9416	238.2265	241.0301	251.2294	263.5322	292.5007 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	47.4449	38.0620	34.2707	25.1082	19.3943	15.8453	17.6921	22.9968	29.8706	39.1919	44.2671	48.7635 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-94.3924	-127.5184	-175.0190	-184.9398	-188.1247	-171.2128	-168.8209	-164.7581	-155.4165	-140.5036	-101.4758	-82.0062 (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	-79.7294	-170.9790	-351.0062	-540.0534	-720.7851	-726.7873	-715.5299	-599.8731	-430.0571	-246.2187	-106.7051	-62.5474 (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												6377.8760 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												79.8000

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Water heating fuel used	3083.0359 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
central heating pump	41.0000 (230c)
main heating flue fan	45.0000 (230e)
Total electricity for the above, kWh/year	86.0000 (231)
Electricity for lighting (calculated in Appendix L)	382.9074 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-6504.4600 (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	3425.3592 (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	6377.8760	0.2100	1339.3540 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3083.0359	0.2100	647.4375 (264)
Space and water heating			1986.7915 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	382.9074	0.1443	55.2654 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1754.1883	0.1359	-238.3424
PV Unit electricity exported	-4750.2717	0.1253	-595.4444
Total			-833.7868 (269)
Total CO2, kg/year			1220.1993 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			6.2900 (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	6377.8760	1.1300	7206.9999 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3083.0359	1.1300	3483.8305 (278)
Space and water heating			10690.8304 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	382.9074	1.5338	587.3162 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1754.1883	1.5022	-2635.1942
PV Unit electricity exported	-4750.2717	0.4601	-2185.5956
Total			-4820.7897 (283)
Total Primary energy kWh/year			6587.4576 (286)
Dwelling Primary energy Rate (DPER)			33.9600 (287)

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

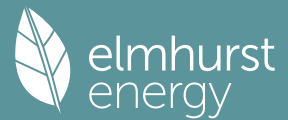
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	95.1000 (1b)	x 2.4000 (2b)	= 228.2400 (1b) - (3b)
First floor	64.8000 (1c)	x 2.6000 (2c)	= 168.4800 (1c) - (3c)
Second floor	34.1000 (1d)	x 2.7000 (2d)	= 92.0700 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	194.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 488.7900 (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	Air changes per hour
Pressure test	40.0000 / (5) = 0.0818 (8)
Pressure Test Method	Yes
Measured/design AP50	Blower Door
Infiltration rate	5.0000 (17)
Number of sides sheltered	0.3318 (18)
	1 (19)

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Shelter factor
Infiltration rate adjusted to include shelter factor

$$(20) = 1 - [0.075 \times (19)] = 0.9250 \quad (20)$$

$$(21) = (18) \times (20) = 0.3069 \quad (21)$$

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													
Effective ac	0.3914	0.3837	0.3760	0.3376	0.3300	0.2916	0.2916	0.2839	0.3069	0.3300	0.3453	0.3607	(22b)
	0.5766	0.5736	0.5707	0.5570	0.5544	0.5425	0.5425	0.5403	0.5471	0.5544	0.5596	0.5650	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			1.8900	1.0000	1.8900			(26)
TER Opening Type			20.1900	1.1450	23.1183			(27)
TER Roof Window			8.8800	1.1450	13.8814			(27a)
Heat Loss Floor			95.1000	0.1300	12.3630			(28a)
Cavity Wall	144.3000	22.0800	122.2200	0.1800	21.9996			(29a)
Stud Wall	28.1000		28.1000	0.1800	5.0580			(29a)
Flat Roof	23.5000	6.0000	17.5000	0.1100	1.9250			(30)
Plane Roof	60.6000		60.6000	0.1100	6.6660			(30)
Slope Roof	13.4000	2.8800	10.5200	0.1100	1.1572			(30)
Total net area of external elements Aum(A, m2)			365.0000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	88.0585			(33)
Main dwelling								
Party Wall			72.7000	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 111.7556 (35)

List of Thermal Bridges

	Length	Psi-value	Total	
K1 Element	16.2000	0.0500	0.8100	
E2 Other lintels (including other steel lintels)	15.3000	0.0500	0.7650	
E3 Sill	33.0000	0.0500	1.6500	
E4 Jamb	28.1000	0.1600	4.4960	
E5 Ground floor (normal)	42.9000	0.0000	0.0000	
E6 Intermediate floor within a dwelling	15.4000	0.0900	1.3860	
E16 Corner (normal)	15.4000	0.0600	0.9240	
E18 Party wall between dwellings	6.2000	0.0800	0.4960	
R1 Head of roof window	6.2000	0.0600	0.3720	
R2 Sill of roof window	11.2000	0.0800	0.8960	
R3 Jamb of roof window				

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 11.7950 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 99.8535 (37)

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

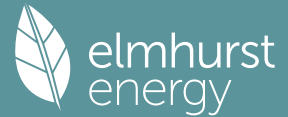
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	93.0028	92.5232	92.0530	89.8447	89.4315	87.5081	87.5081	87.1519	88.2489	89.4315	90.2673	91.1412	(38)
Heat transfer coeff	192.8563	192.3767	191.9065	189.6982	189.2850	187.3616	187.3616	187.0054	188.1025	189.2850	190.1208	190.9947	(39)
Average = Sum(39)m / 12 =												189.6962	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9941	0.9916	0.9892	0.9778	0.9757	0.9658	0.9658	0.9639	0.9696	0.9757	0.9800	0.9845	(40)
HLP (average)												0.9778	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.9941 (42)
Hot water usage for mixer showers													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths													
85.8552	84.5801	82.7846	79.4739	76.9949	74.2460	72.7612	74.5442	76.4856	79.4270	82.8058	85.5650		(42b)
Hot water usage for other uses													
45.2927	43.6457	41.9987	40.3516	38.7046	37.0576	37.0576	38.7046	40.3516	41.9987	43.6457	45.2927		(42c)
Average daily hot water use (litres/day)												120.7765	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	131.1479	128.2258	124.7832	119.8255	115.6995	111.3037	109.8189	113.2489	116.8373	121.4256	126.4515	130.8576	(44)
Energy conte	207.7062	182.5918	191.7872	164.0351	155.7538	136.8608	132.8164	140.2258	144.0720	164.7734	180.1533	204.8914	(45)
Energy content (annual)										Total = Sum(45)m =		2005.6673	
Distribution loss (46)m = 0.15 x (45)m	31.1559	27.3888	28.7681	24.6053	23.3631	20.5291	19.9225	21.0339	21.6108	24.7160	27.0230	30.7337	(46)
Water storage loss:													
Store volume												300.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												2.1127	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												1.1409	(55)
Total storage loss													
35.3664	31.9439	35.3664	34.2256	35.3664	34.2256	35.3664	35.3664	34.2256	35.3664	34.2256	35.3664		(56)
If cylinder contains dedicated solar storage													
35.3664	31.9439	35.3664	34.2256	35.3664	34.2256	35.3664	35.3664	34.2256	35.3664	34.2256	35.3664		(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													
266.3350	235.5469	250.4160	220.7727	214.3826	193.5984	191.4452	198.8546	200.8096	223.4022	236.8909	263.5202		(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	266.3350	235.5469	250.4160	220.7727	214.3826	193.5984	191.4452	198.8546	200.8096	223.4022	236.8909	263.5202	(64)
Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2695.9743	(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													
115.9654	103.0758	110.6723	99.9317	98.6912	90.8963	91.0645	93.5281	93.2940	101.6902	105.2910	115.0294		(65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	149.7054	149.7054	149.7054	149.7054	149.7054	149.7054	149.7054	149.7054	149.7054	149.7054	149.7054	149.7054	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	192.4157	213.0317	192.4157	198.8295	192.4157	198.8295	192.4157	192.4157	198.8295	192.4157	198.8295	192.4157	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	365.3068	369.0975	359.5450	339.2087	313.5379	289.4109	273.2926	269.5019	279.0544	299.3906	325.0615	349.1885	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.9705	37.9705	37.9705	37.9705	37.9705	37.9705	37.9705	37.9705	37.9705	37.9705	37.9705	37.9705	(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)	-119.7643	-119.7643	-119.7643	-119.7643	-119.7643	-119.7643	-119.7643	-119.7643	-119.7643	-119.7643	-119.7643	-119.7643	(71)
Water heating gains (Table 5)	155.8674	153.3866	148.7531	138.7941	132.6494	126.2448	122.3985	125.7098	129.5750	136.6804	146.2375	154.6095	(72)
Total internal gains	784.5015	806.4274	771.6254	747.7440	709.5146	682.3969	656.0185	655.5390	675.3706	699.3984	741.0402	767.1253	(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
Northeast					10.6800	11.2829	0.6300	0.7000				0.7700	36.8269 (75)
Southeast					2.6400	36.7938	0.6300	0.7000				0.7700	29.6859 (77)
Southwest					6.8700	36.7938	0.6300	0.7000				0.7700	77.2509 (79)
Northeast					2.1600	17.4137	0.6300	0.7000				1.0000	14.9288 (82)
Southwest					0.7200	38.2331	0.6300	0.7000				1.0000	10.9258 (82)
Horizontal					6.0000	26.0000	0.6300	0.7000				1.0000	61.9164 (82)
Solar gains	231.5348	437.3946	703.2368	1031.5165	1290.4024	1337.4755	1266.2161	1066.4271	816.9114	512.5774	285.3862	192.8055	(83)
Total gains	1016.0363	1243.8220	1474.8621	1779.2605	1999.9171	2019.8724	1922.2345	1721.9661	1492.2820	1211.9758	1026.4264	959.9308	(84)

7. Mean internal temperature (heating season)

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

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	31.2273	31.3052	31.3819	31.7472	31.8165	32.1431	32.1431	32.2043	32.0165	31.8165	31.6766	31.5317	21.0000 (85)
alpha	3.0818	3.0870	3.0921	3.1165	3.1211	3.1429	3.1429	3.1470	3.1344	3.1211	3.1118	3.1021	
util living area	0.9803	0.9633	0.9287	0.8435	0.7071	0.5407	0.4112	0.4697	0.7029	0.9022	0.9671	0.9833	(86)
MIT	18.6999	19.0349	19.5367	20.1739	20.6397	20.8883	20.9646	20.9464	20.7404	20.0895	19.2858	18.6508	(87)
Th 2	20.0882	20.0903	20.0923	20.1019	20.1036	20.1119	20.1119	20.1135	20.1087	20.1036	20.1000	20.0963	(88)
util rest of house	0.9771	0.9576	0.9175	0.8196	0.6650	0.4789	0.3345	0.3891	0.6448	0.8816	0.9610	0.9806	(89)
MIT 2	17.3658	17.7917	18.4242	19.2124	19.7554	20.0244	20.0918	20.0809	19.8839	19.1286	18.1202	17.3081	(90)
Living area fraction	17.8781	18.2691	18.8514	19.5817	20.0950	20.3562	20.4269	20.4132	20.2128	19.4976	18.5678	17.8237	(92)
MIT	17.8781	18.2691	18.8514	19.5817	20.0950	20.3562	20.4269	20.4132	20.2128	19.4976	18.5678	17.8237	(93)
Temperature adjustment												0.0000	
adjusted MIT	17.8781	18.2691	18.8514	19.5817	20.0950	20.3562	20.4269	20.4132	20.2128	19.4976	18.5678	17.8237	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9662	0.9422	0.8983	0.8038	0.6645	0.4965	0.3623	0.4172	0.6521	0.8647	0.9468	0.9709	(94)
Useful gains	981.7020	1171.9298	1324.8573	1430.2270	1328.9807	1002.9197	696.4085	718.4453	973.1545	1048.0412	971.8614	931.9922	(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	2618.6312	2571.9055	2370.3155	2026.2908	1589.0498	1078.4861	717.0216	750.4943	1149.8393	1684.1766	2180.2682	2602.0542	(97)
Space heating kWh	1217.8753	940.7837	777.8209	429.1660	193.4914	0.0000	0.0000	0.0000	0.0000	473.2847	870.0529	1242.5261	(98a)
Space heating requirement - total per year (kWh/year)												6145.0009	
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	1217.8753	940.7837	777.8209	429.1660	193.4914	0.0000	0.0000	0.0000	0.0000	473.2847	870.0529	1242.5261	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												6145.0009	
Space heating per m2										(98c) / (4) =		31.6753	(99)

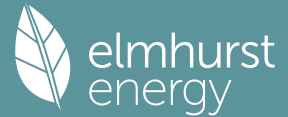
9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)

Fraction of space heat from main system(s)	0.0000	(201)
Efficiency of main space heating system 1 (in %)	1.0000	(202)
Efficiency of main space heating system 2 (in %)	92.3000	(206)
Efficiency of secondary/supplementary heating system, %	0.0000	(207)
	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	1217.8753	940.7837	777.8209	429.1660	193.4914	0.0000	0.0000	0.0000	0.0000	473.2847	870.0529	1242.5261	(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)	1319.4748	1019.2673	842.7095	464.9685	209.6331	0.0000	0.0000	0.0000	0.0000	512.7679	942.6359	1346.1821	(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)

Full SAP Calculation Printout



Water heating													
Water heating requirement	266.3350	235.5469	250.4160	220.7727	214.3826	193.5984	191.4452	198.8546	200.8096	223.4022	236.8909	263.5202	(64)
Efficiency of water heater												79.8000	(216)
(217)m	87.0385	86.8389	86.4261	85.5236	83.8306	79.8000	79.8000	79.8000	79.8000	85.7006	86.7072	87.0815	(217)
Fuel for water heating, kWh/month	305.9968	271.2458	289.7456	258.1425	255.7331	242.6045	239.9063	249.1912	251.6411	260.6775	273.2077	302.6132	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685	(231)
Lighting	39.9802	32.0736	28.8787	21.1578	16.3429	13.3523	14.9085	19.3787	25.1710	33.0257	37.3024	41.0914	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-80.2889	-109.0174	-150.9099	-163.0780	-170.3071	-156.8039	-154.6276	-148.4923	-137.1306	-121.2267	-86.6691	-69.8934	(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	-58.9562	-122.1750	-239.6078	-355.4101	-465.8496	-466.7983	-461.5147	-392.7960	-290.4946	-173.4574	-78.2682	-46.7829	(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												6657.6391	(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												3200.7053	(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)												322.6629	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-4700.5558	(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												5566.4516	(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	6657.6391	0.2100	1398.1042	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3200.7053	0.2100	672.1481	(264)
Space and water heating			2070.2523	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	322.6629	0.1443	46.5702	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1548.4450	0.1354	-209.7275	
PV Unit electricity exported	-3152.1108	0.1263	-397.9775	
Total			-607.7049	(269)
Total CO2, kg/year			1521.0469	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			7.8400	(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	6657.6391	1.1300	7523.1322	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3200.7053	1.1300	3616.7970	(278)
Space and water heating			11139.9292	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	322.6629	1.5338	494.9112	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1548.4450	1.5006	-2323.6360	
PV Unit electricity exported	-3152.1108	0.4635	-1460.8993	
Total			-3784.5353	(283)
Total Primary energy kWh/year			7980.4059	(286)
Target Primary Energy Rate (TPER)			41.1400	(287)

Full SAP Calculation Printout



Property Reference	Plot 2 7HR			Issued on Date	28/03/2025
Assessment Reference	Plot 2- Gas boiler	Prop Type Ref	RHS Plot		
Property	Plot 2, 7 Hawthorne Road, READING, RG4 6LY				
SAP Rating	101 A	DER	6.29	TER	7.84
Environmental	93 A	% DER < TER			19.77
CO ₂ Emissions (t/year)	0.97	DFEE	33.56	TFEE	36.41
Compliance Check	See BREL	% DFEE < TFEE			7.81
% DPER < TPER	17.46	DPER	33.96	TPER	41.14
Assessor Details	Mr. Dhiraj Karsan			Assessor ID	M078-0001
Client					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	95.1000 (1b)	x 2.4000 (2b)	= 228.2400 (1b) - (3b)
First floor	64.8000 (1c)	x 2.6000 (2c)	= 168.4800 (1c) - (3c)
Second floor	34.1000 (1d)	x 2.7000 (2d)	= 92.0700 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	194.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 488.7900 (5)

2. Ventilation rate

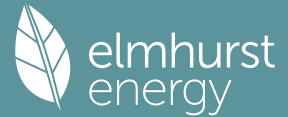
	m ³ per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
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) =	0.0818 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.3318	(18)
Number of sides sheltered	1	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3069 (21)

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
	0.3914	0.3837	0.3760	0.3376	0.3300	0.2916	0.2916	0.2839	0.3069	0.3300	0.3453	0.3607 (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	0.5766	0.5736	0.5707	0.5570	0.5544	0.5425	0.5425	0.5403	0.5471	0.5544	0.5596	0.5650 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Windows			20.1900	1.1450	23.1183		(27)
Roof Windows			8.8800	1.1450	10.1679		(27a)
Door			1.8900	1.2000	2.2680		(26)
Heat Loss Floor			95.1000	0.1100	10.4610	110.0000	10461.0000 (28a)
Cavity Wall	144.3000	22.0800	122.2200	0.1800	21.9996	60.0000	7333.2000 (29a)
Stud Wall	28.1000		28.1000	0.1100	3.0910	9.0000	252.9000 (29a)
Flat Roof	23.5000	6.0000	17.5000	0.1400	2.4500	9.0000	157.5000 (30)
Plane Roof	60.6000		60.6000	0.1132	6.8604	9.0000	545.4000 (30)
Slope Roof	13.4000	2.8800	10.5200	0.1300	1.3676	9.0000	94.6800 (30)
Total net area of external elements Aum (A, m ²)			365.0000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	81.7838		(33)
Main dwelling							
Party Wall			72.7000	0.0000	0.0000	0.0000	0.0000 (32)
Internal Wall			216.2000			9.0000	1945.8000 (32c)
Internal Ceiling			64.8000			9.0000	583.2000 (32e)
Internal Ceiling 2			34.1000			9.0000	306.9000 (32e)

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Heat capacity Cm = Sum(A x k)											
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K											
List of Thermal Bridges											
K1 Element											
E2 Other lintels (including other steel lintels)											
E3 Sill											
E4 Jamb											
E5 Ground floor (normal)											
E6 Intermediate floor within a dwelling											
E16 Corner (normal)											
E18 Party wall between dwellings											
R1 Head of roof window											
R2 Sill of roof window											
R3 Jamb of roof window											
Thermal bridges (Sum(L x Psi) calculated using Appendix K)											
Point Thermal bridges											
Total fabric heat loss											
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)											
(38)m											
Heat transfer coeff											
Average = Sum(39)m / 12 =											
HLP											
HLP (average)											
Days in mont											
4. Water heating energy requirements (kWh/year)											
Assumed occupancy											
Hot water usage for mixer showers											
Hot water usage for baths											
Hot water usage for other uses											
Average daily hot water use (litres/day)											
Daily hot water use											
Energy conte											
Energy content (annual)											
Distribution loss (46)m = 0.15 x (45)m											
Water storage loss:											
Total storage loss											
If cylinder contains dedicated solar storage											
Primary loss											
Combi loss											
Total heat required for water heating calculated for each month											
WWHRS											
PV diverter											
Solar input											
FGHRS											
Output from w/h											
12Total per year (kWh/year)											
Electric shower(s)											
Heat gains from water heating, kWh/month											
5. Internal gains (see Table 5 and 5a)											
Metabolic gains (Table 5), Watts											
(66)m											
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5											
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5											
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5											
Pumps, fans											
Losses e.g. evaporation (negative values) (Table 5)											
Water heating gains (Table 5)											
Total internal gains											
6. Solar gains											
[Jan]											
Area											
Solar flux											
Specific data											
Specific data											
Access factor											
Gains											
Northeast											
Southeast											
Southwest											
Northeast											

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Southwest	0.7200	38.2331	0.7600	0.7000	1.0000	13.1803 (82)
Horizontal	6.0000	26.0000	0.7600	0.7000	1.0000	74.6928 (82)

Solar gains	279.3118	527.6506	848.3491	1244.3691	1556.6759	1613.4625	1527.4988	1286.4834	985.4804	618.3474	344.2754	232.5908 (83)
Total gains	959.9931	1231.3520	1519.7417	1897.8516	2175.4438	2211.8177	2101.9967	1858.8086	1575.5914	1225.3474	987.2146	896.7072 (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	32.4400	32.5241	32.6069	33.0014	33.0763	33.4295	33.4295	33.4957	33.2926	33.0763	32.9252	32.7686
alpha	3.1627	3.1683	3.1738	3.2001	3.2051	3.2286	3.2286	3.2330	3.2195	3.2051	3.1950	3.1846
util living area	0.9829	0.9634	0.9209	0.8161	0.6597	0.4888	0.3669	0.4263	0.6679	0.8958	0.9696	0.9861 (86)
MIT	18.7416	19.1189	19.6590	20.3057	20.7280	20.9239	20.9772	20.9634	20.7932	20.1613	19.3319	18.6851 (87)
Th 2	20.1194	20.1214	20.1235	20.1331	20.1349	20.1432	20.1432	20.1448	20.1400	20.1349	20.1312	20.1274 (88)
util rest of house	0.9802	0.9578	0.9090	0.7904	0.6175	0.4318	0.2991	0.3534	0.6103	0.8748	0.9641	0.9839 (89)
MIT 2	18.0295	18.4036	18.9332	19.5540	19.9321	20.0972	20.1332	20.1275	20.0016	19.4349	18.6246	17.9789 (90)
Living area fraction									fLA = Living area / (4) =			0.3840 (91)
MIT	18.3030	18.6783	19.2119	19.8427	20.2377	20.4147	20.4573	20.4485	20.3056	19.7139	18.8962	18.2501 (92)
Temperature adjustment												0.0000
adjusted MIT	18.3030	18.6783	19.2119	19.8427	20.2377	20.4147	20.4573	20.4485	20.3056	19.7139	18.8962	18.2501 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9726	0.9460	0.8941	0.7809	0.6228	0.4503	0.3243	0.3799	0.6221	0.8627	0.9536	0.9772 (94)
Useful gains	933.6461	1164.7986	1358.7468	1482.0687	1354.7967	995.9632	681.7281	706.1178	980.1275	1057.0541	941.4531	876.2986 (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	2599.6017	2551.2875	2347.8441	1996.9161	1554.5084	1047.5255	694.8992	727.9041	1122.5542	1659.4084	2157.6605	2582.2002 (97)
Space heating kWh	1239.4710	931.7206	735.8884	370.6901	148.5855	0.0000	0.0000	0.0000	0.0000	448.1516	875.6693	1269.1908 (98a)
Space heating requirement - total per year (kWh/year)												6019.3673
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	1239.4710	931.7206	735.8884	370.6901	148.5855	0.0000	0.0000	0.0000	0.0000	448.1516	875.6693	1269.1908 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												6019.3673
Space heating per m2										(98c) / (4) =		31.0277 (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	1693.4281	1333.1242	1366.4476	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8712	0.9146	0.8821	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1475.3079	1219.2123	1205.3954	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	2354.9745	2238.2971	1980.7808	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	633.3599	758.1991	576.8868	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	158.3400	189.5498	144.2217	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												492.1114 (107)
Energy for space heating												31.0277 (99)
Energy for space cooling												2.5367 (108)
Total												33.5643 (109)
Fabric Energy Efficiency (DFEE)												33.6 (109)

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

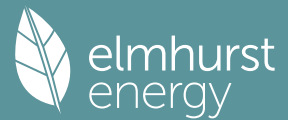
1. Overall dwelling characteristics

Main dwelling	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	95.1000 (1b)	x 2.4000 (2b)	= 228.2400 (1b) - (3b)
First floor	64.8000 (1c)	x 2.6000 (2c)	= 168.4800 (1c) - (3c)
Second floor	34.1000 (1d)	x 2.7000 (2d)	= 92.0700 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	194.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	488.7900 (5)

2. Ventilation rate

m3 per hour

Full SAP Calculation Printout



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) =	0.0818 (8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3318	(18)
Number of sides sheltered		1	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.9250	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3069	(21)

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
	0.3914	0.3837	0.3760	0.3376	0.3300	0.2916	0.2916	0.2839	0.3069	0.3300	0.3453	0.3607	(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	0.5766	0.5736	0.5707	0.5570	0.5544	0.5425	0.5425	0.5403	0.5471	0.5544	0.5596	0.5650	(25)

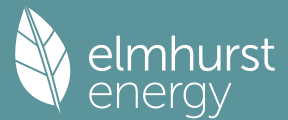
3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			1.8900	1.0000	1.8900			(26)
TER Opening Type			20.1900	1.1450	23.1183			(27)
TER Roof Window			8.8800	1.1450	13.8814			(27a)
Heat Loss Floor			95.1000	0.1300	12.3630			(28a)
Cavity Wall		22.0800	122.2200	0.1800	21.9996			(29a)
Stud Wall	144.3000		28.1000	0.1800	5.0580			(29a)
Flat Roof	28.1000	6.0000	17.5000	0.1100	1.9250			(30)
Plane Roof	23.5000		60.6000	0.1100	6.6660			(30)
Slope Roof	60.6000		10.5200	0.1100	1.1572			(30)
	13.4000	2.8800						(30)
Total net area of external elements Aum(A, m2)			365.0000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)... (30) + (32) =	88.0585			(33)
Main dwelling								
Party Wall			72.7000	0.0000	0.0000			(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							111.7556	(35)
List of Thermal Bridges								
K1 Element				Length	Psi-value	Total		
E2 Other lintels (including other steel lintels)				16.2000	0.0500	0.8100		
E3 Sill				15.3000	0.0500	0.7650		
E4 Jamb				33.0000	0.0500	1.6500		
E5 Ground floor (normal)				28.1000	0.1600	4.4960		
E6 Intermediate floor within a dwelling				42.9000	0.0000	0.0000		
E16 Corner (normal)				15.4000	0.0900	1.3860		
E18 Party wall between dwellings				15.4000	0.0600	0.9240		
R1 Head of roof window				6.2000	0.0800	0.4960		
R2 Sill of roof window				6.2000	0.0600	0.3720		
R3 Jamb of roof window				11.2000	0.0800	0.8960		
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							11.7950	(36)
Point Thermal Bridges						(36a) =	0.0000	
Total fabric heat loss						(33) + (36) + (36a) =	99.8535	(37)

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.9941 (42)
Hot water usage for mixer showers													(42a)
Hot water usage for baths													(42b)
Hot water usage for other uses													(42c)
Average daily hot water use (litres/day)													(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	77.4194	75.2953	72.9764	70.0906	67.5159	64.8403	64.2847	66.5989	68.9724	71.7200	74.6314	77.3108	(44)
Energy content (annual)	122.6135	107.2195	112.1620	95.9505	90.8894	79.7287	77.7468	82.4633	85.0498	97.3234	106.3261	121.0501	(45)
Distribution loss (46)m = 0.15 x (45)m													
Water storage loss:	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Total storage loss													
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	(56)
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	(57)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Total heat required for water heating calculated for each month													(61)

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WWHRS	104.2215	91.1366	95.3377	81.5579	77.2560	67.7694	66.0847	70.0938	72.2923	82.7249	90.3772	102.8926 (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)
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 (63b)
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 (63c)
Output from w/h	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
12Total per year (kWh/year)	104.2215	91.1366	95.3377	81.5579	77.2560	67.7694	66.0847	70.0938	72.2923	82.7249	90.3772	102.8926 (64)
Electric shower(s)	59.5990	53.1032	57.9867	55.3360	56.3743	53.7756	55.5681	56.3743	55.3360	57.9867	56.8963	59.5990 (64a)
Heat gains from water heating, kWh/month	40.9551	36.0599	38.3311	34.2235	33.4076	30.3863	30.4132	31.6170	31.9071	35.1779	36.8184	40.6229 (65)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 677.9351 (64a)												1001.7446 (64)
												1002 (64)

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	149.7054	149.7054	149.7054	149.7054	149.7054	149.7054	149.7054	149.7054	149.7054	149.7054	149.7054	149.7054	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	192.4157	213.0317	192.4157	198.8295	192.4157	198.8295	192.4157	192.4157	198.8295	192.4157	198.8295	192.4157	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	365.3068	369.0975	359.5450	339.2087	313.5379	289.4109	273.2926	269.5019	279.0544	299.3906	325.0615	349.1885	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.9705	37.9705	37.9705	37.9705	37.9705	37.9705	37.9705	37.9705	37.9705	37.9705	37.9705	37.9705	(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)	-119.7643	-119.7643	-119.7643	-119.7643	-119.7643	-119.7643	-119.7643	-119.7643	-119.7643	-119.7643	-119.7643	-119.7643	(71)
Water heating gains (Table 5)	55.0472	53.6606	51.5203	47.5326	44.9027	42.2031	40.8780	42.4960	44.3154	47.2821	51.1366	54.6007	(72)
Total internal gains	680.6813	703.7014	671.3926	653.4825	618.7679	598.3552	574.4979	572.3252	590.1110	607.0001	642.9393	664.1165	(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		
Northeast					10.6800	11.2829	0.6300	0.7000	0.7700	36.8269 (75)		
Southeast					2.6400	36.7938	0.6300	0.7000	0.7700	29.6859 (77)		
Southwest					6.8700	36.7938	0.6300	0.7000	0.7700	77.2509 (79)		
Northeast					2.1600	17.4137	0.6300	0.7000	1.0000	14.9288 (82)		
Southwest					0.7200	38.2331	0.6300	0.7000	1.0000	10.9258 (82)		
Horizontal					6.0000	26.0000	0.6300	0.7000	1.0000	61.9164 (82)		
Solar gains	231.5348	437.3946	703.2368	1031.5165	1290.4024	1337.4755	1266.2161	1066.4271	816.9114	512.5774	285.3862	192.8055 (83)
Total gains	912.2161	1141.0960	1374.6293	1684.9990	1909.1703	1935.8307	1840.7140	1638.7523	1407.0224	1119.5775	928.3254	856.9220 (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	31.2273	31.3052	31.3819	31.7472	31.8165	32.1431	32.1431	32.2043	32.0165	31.8165	31.6766	31.5317
alpha	3.0818	3.0870	3.0921	3.1165	3.1211	3.1429	3.1429	3.1470	3.1344	3.1211	3.1118	3.1021
util living area	0.9852	0.9705	0.9395	0.8590	0.7258	0.5588	0.4273	0.4897	0.7267	0.9179	0.9746	0.9877 (86)
MIT	18.5994	18.9411	19.4557	20.1185	20.6102	20.8774	20.9605	20.9397	20.7129	20.0211	19.1945	18.5497 (87)
Th 2	20.0882	20.0903	20.0923	20.1019	20.1036	20.1119	20.1119	20.1135	20.1087	20.1036	20.1000	20.0963 (88)
util rest of house	0.9828	0.9658	0.9296	0.8367	0.6844	0.4962	0.3483	0.4069	0.6698	0.8999	0.9698	0.9857 (89)
MIT 2	17.8671	18.2069	18.7144	19.3583	19.8082	20.0366	20.0943	20.0846	19.9129	19.2802	18.4677	17.8232 (90)
Living area fraction	18.1483	18.4888	18.9991	19.6502	20.1162	20.3595	20.4269	20.4130	20.2201	19.5647	18.7468	18.1022 (92)
MIT	18.1483	18.4888	18.9991	19.6502	20.1162	20.3595	20.4269	20.4130	20.2201	19.5647	18.7468	18.1022 (93)
Temperature adjustment	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
adjusted MIT	18.1483	18.4888	18.9991	19.6502	20.1162	20.3595	20.4269	20.4130	20.2201	19.5647	18.7468	18.1022 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	890.0193	1089.6000	1257.7167	1388.1938	1307.8822	995.5879	693.9461	714.1981	953.2802	992.6864	891.2372	839.3718 (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	2670.7376	2614.1754	2398.6493	2039.3021	1593.0520	1079.1016	717.0221	750.4488	1151.2049	1696.8865	2214.3003	2655.2397 (97)
Space heating kWh	1324.8544	1024.5147	848.8538	468.7980	212.1664	0.0000	0.0000	0.0000	0.0000	523.9249	952.6055	1351.0057 (98a)
Space heating requirement - total per year (kWh/year)	1324.8544	1024.5147	848.8538	468.7980	212.1664	0.0000	0.0000	0.0000	0.0000	523.9249	952.6055	1351.0057 (98c)
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Space heating kWh	1324.8544	1024.5147	848.8538	468.7980	212.1664	0.0000	0.0000	0.0000	0.0000	523.9249	952.6055	1351.0057 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	1324.8544	1024.5147	848.8538	468.7980	212.1664	0.0000	0.0000	0.0000	0.0000	523.9249	952.6055	1351.0057 (98c)
Space heating per m ²	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (99)

8c. Space cooling requirement

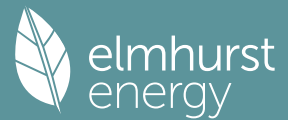
Calculated for June, July and August. See Table 10b	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000

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Heat loss rate W												
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	1761.1990	1386.4758	1421.2411	0.0000	0.0000	0.0000	0.0000 (100)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.8137	0.8699	0.8297	0.0000	0.0000	0.0000	0.0000 (101)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1433.1634	1206.1303	1179.2170	0.0000	0.0000	0.0000	0.0000 (102)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	2055.9508	1955.1216	1741.8962	0.0000	0.0000	0.0000	0.0000 (103)
Cooled fraction	0.0000	0.0000	0.0000	0.0000	0.0000	448.4069	557.2496	418.6333	0.0000	0.0000	0.0000	0.0000 (104)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	FC = cooled area / (4) =			1.0000 (105)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	112.1017	139.3124	104.6583	0.2500	0.2500	0.2500	0.2500 (106)
Space cooling requirement									0.0000	0.0000	0.0000	0.0000 (107)
Energy for space heating												356.0725 (107)
Energy for space cooling												34.5707 (99)
Total												1.8354 (108)
Fabric Energy Efficiency (TFEE)												36.4062 (109)
												36.4 (109)

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Property Reference	Plot 2 7HR			Issued on Date	28/03/2025
Assessment Reference	Plot 2- Gas boiler	Prop Type Ref	RHS Plot		
Property	Plot 2, 7 Hawthorne Road, READING, RG4 6LY				
SAP Rating	101 A	DER	6.29	TER	7.84
Environmental	93 A	% DER < TER			19.77
CO ₂ Emissions (t/year)	0.97	DFEE	33.56	TFEE	36.41
Compliance Check	See BREL	% DFEE < TFEE			7.81
% DPER < TPER	17.46	DPER	33.96	TPER	41.14
Assessor Details	Mr. Dhiraj Karsan			Assessor ID	M078-0001
Client					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	95.1000 (1b)	x 2.4000 (2b)	= 228.2400 (1b) - (3b)
First floor	64.8000 (1c)	x 2.6000 (2c)	= 168.4800 (1c) - (3c)
Second floor	34.1000 (1d)	x 2.7000 (2d)	= 92.0700 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	194.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 488.7900 (5)

2. Ventilation rate

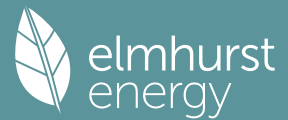
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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) = 0.0818 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3318 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3069 (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	0.3914	0.3837	0.3760	0.3376	0.3300	0.2916	0.2916	0.2839	0.3069	0.3300	0.3453	0.3607 (22b)
Effective ac	0.5766	0.5736	0.5707	0.5570	0.5544	0.5425	0.5425	0.5403	0.5471	0.5544	0.5596	0.5650 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Windows			20.1900	1.1450	23.1183		(27)
Roof Windows			8.8800	1.1450	10.1679		(27a)
Door			1.8900	1.2000	2.2680		(26)
Heat Loss Floor			95.1000	0.1100	10.4610	110.0000	10461.0000 (28a)
Cavity Wall	144.3000	22.0800	122.2200	0.1800	21.9996	60.0000	7333.2000 (29a)
Stud Wall	28.1000		28.1000	0.1100	3.0910	9.0000	252.9000 (29a)
Flat Roof	23.5000	6.0000	17.5000	0.1400	2.4500	9.0000	157.5000 (30)
Plane Roof	60.6000		60.6000	0.1132	6.8604	9.0000	545.4000 (30)
Slope Roof	13.4000	2.8800	10.5200	0.1300	1.3676	9.0000	94.6800 (30)
Total net area of external elements Aum(A, m ²)			365.0000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	81.7838		(33)
Main dwelling							
Party Wall			72.7000	0.0000	0.0000	0.0000	0.0000 (32)
Internal Wall			216.2000			9.0000	1945.8000 (32c)
Internal Ceiling			64.8000			9.0000	583.2000 (32e)
Internal Ceiling 2			34.1000			9.0000	306.9000 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	21680.5800 (34)

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

111.7556 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element	16.2000	0.0400	0.6480
E2 Other lintels (including other steel lintels)	15.3000	0.0300	0.4590
E3 Sill	33.0000	0.0300	0.9900
E4 Jamb	28.1000	0.0600	1.6860
E5 Ground floor (normal)	42.9000	0.0700	3.0030
E6 Intermediate floor within a dwelling	15.4000	0.0900	1.3860
E16 Corner (normal)	15.4000	0.0600	0.9240
E18 Party wall between dwellings	6.2000	0.0800	0.4960
R1 Head of roof window	6.2000	0.0600	0.3720
R2 Sill of roof window	11.2000	0.0800	0.8960
R3 Jamb of roof window			

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

Point Thermal bridges	(36a) =	10.8600 (36)
Total fabric heat loss	(33) + (36) + (36a) =	92.6438 (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	93.0028	92.5232	92.0530	89.8447	89.4315	87.5081	87.5081	87.1519	88.2489	89.4315	90.2673	91.1412 (38)
Heat transfer coeff	185.6467	185.1670	184.6968	182.4885	182.0753	180.1519	180.1519	179.7957	180.8928	182.0753	182.9112	183.7850 (39)
Average = Sum(39)m / 12 =												182.4865

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.9569	0.9545	0.9520	0.9407	0.9385	0.9286	0.9286	0.9268	0.9324	0.9385	0.9428	0.9473 (40)
HLP (average)												0.9407
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.9941 (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	85.8552	84.5801	82.7846	79.4739	76.9949	74.2460	72.7612	74.5442	76.4856	79.4270	82.8058	85.5650 (42b)
Hot water usage for other uses	45.2927	43.6457	41.9987	40.3516	38.7046	37.0576	37.0576	38.7046	40.3516	41.9987	43.6457	45.2927 (42c)
Average daily hot water use (litres/day)												120.7765 (43)
Daily hot water use	131.1479	128.2258	124.7832	119.8255	115.6995	111.3037	109.8189	113.2489	116.8373	121.4256	126.4515	130.8576 (44)
Energy conte	207.7062	182.5918	191.7872	164.0351	155.7538	136.8608	132.8164	140.2258	144.0720	164.7734	180.1533	204.8914 (45)
Energy content (annual)										Total = Sum(45)m =		2005.6673
Distribution loss (46)m = 0.15 x (45)m	31.1559	27.3888	28.7681	24.6053	23.3631	20.5291	19.9225	21.0339	21.6108	24.7160	27.0230	30.7337 (46)
Water storage loss:												
Store volume												300.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5900 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.8586 (55)
Total storage loss	26.6166	24.0408	26.6166	25.7580	26.6166	25.7580	26.6166	26.6166	25.7580	26.6166	25.7580	26.6166 (56)
If cylinder contains dedicated solar storage	26.6166	24.0408	26.6166	25.7580	26.6166	25.7580	26.6166	26.6166	25.7580	26.6166	25.7580	26.6166 (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	257.5852	227.6438	241.6662	212.3051	205.6328	185.1308	182.6954	190.1048	192.3420	214.6524	228.4233	254.7704 (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	257.5852	227.6438	241.6662	212.3051	205.6328	185.1308	182.6954	190.1048	192.3420	214.6524	228.4233	254.7704 (64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2592.9523 (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	108.9655	96.7534	103.6724	93.1577	91.6913	84.1222	84.0647	86.5283	86.5199	94.6904	98.5170	108.0296 (65)

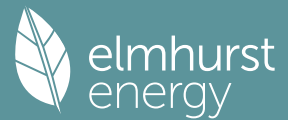
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
(66)m	149.7054	149.7054	149.7054	149.7054	149.7054	149.7054	149.7054	149.7054	149.7054	149.7054	149.7054	149.7054 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	192.4157	213.0317	192.4157	198.8295	192.4157	198.8295	192.4157	192.4157	198.8295	192.4157	198.8295	192.4157 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	365.3068	369.0975	359.5450	339.2087	313.5379	289.4109	273.2926	269.5019	279.0544	299.3906	325.0615	349.1885 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.9705	37.9705	37.9705	37.9705	37.9705	37.9705	37.9705	37.9705	37.9705	37.9705	37.9705	37.9705 (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 (70)
Losses e.g. evaporation (negative values) (Table 5)	-119.7643	-119.7643	-119.7643	-119.7643	-119.7643	-119.7643	-119.7643	-119.7643	-119.7643	-119.7643	-119.7643	-119.7643 (71)
Water heating gains (Table 5)	146.4590	143.9782	139.3447	129.3857	123.2410	116.8364	112.9901	116.3014	120.1666	127.2720	136.8291	145.2011 (72)
Total internal gains	775.0931	797.0190	762.2170	738.3356	700.1062	672.9885	646.6101	646.1306	665.9622	689.9900	731.6318	757.7169 (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
Northeast	10.6800	11.2829	0.7600	0.7000	0.7700	44.4261 (75)
Southeast	2.6400	36.7938	0.7600	0.7000	0.7700	35.8116 (77)

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Southwest			6.8700		36.7938		0.7600		0.7000		0.7700		93.1916 (79)
Northeast			2.1600		17.4137		0.7600		0.7000		1.0000		18.0094 (82)
Southwest			0.7200		38.2331		0.7600		0.7000		1.0000		13.1803 (82)
Horizontal			6.0000		26.0000		0.7600		0.7000		1.0000		74.6928 (82)

Solar gains	279.3118	527.6506	848.3491	1244.3691	1556.6759	1613.4625	1527.4988	1286.4834	985.4804	618.3474	344.2754	232.5908	(83)
Total gains	1054.4049	1324.6696	1610.5661	1982.7047	2256.7822	2286.4510	2174.1088	1932.6141	1651.4426	1308.3373	1075.9072	990.3076	(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	32.4400	32.5241	32.6069	33.0014	33.0763	33.4295	33.4295	33.4957	33.2926	33.0763	32.9252	32.7686	
alpha	3.1627	3.1683	3.1738	3.2001	3.2051	3.2286	3.2286	3.2330	3.2195	3.2051	3.1950	3.1846	
util living area	0.9780	0.9560	0.9098	0.8012	0.6439	0.4752	0.3556	0.4118	0.6477	0.8802	0.9620	0.9817	(86)
MIT	19.2778	19.5551	19.9491	20.4146	20.7143	20.8521	20.8892	20.8800	20.7631	20.3176	19.7141	19.2366	(87)
Th 2	20.1194	20.1214	20.1235	20.1331	20.1349	20.1432	20.1432	20.1448	20.1400	20.1349	20.1312	20.1274	(88)
util rest of house	0.9745	0.9494	0.8966	0.7744	0.6016	0.4193	0.2896	0.3408	0.5898	0.8569	0.9552	0.9788	(89)
MIT 2	18.0706	18.4226	18.9169	19.4885	19.8310	19.9803	20.0122	20.0078	19.8970	19.3881	18.6347	18.0239	(90)
Living area fraction										FLA = Living area / (4) =		0.3840	(91)
MIT	18.5342	18.8575	19.3133	19.8441	20.1702	20.3151	20.3490	20.3427	20.2296	19.7451	19.0492	18.4896	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.3842	18.7075	19.1633	19.6941	20.0202	20.1651	20.1990	20.1927	20.0796	19.5951	18.8992	18.3396	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9655	0.9359	0.8793	0.7594	0.5956	0.4207	0.2940	0.3449	0.5855	0.8397	0.9427	0.9708	(94)
Useful gains	1017.9781	1239.7033	1416.1097	1505.6989	1344.1478	962.0183	639.1534	666.5248	966.8442	1098.6703	1014.2204	961.4094	(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	2614.6793	2556.6878	2338.8624	1969.7997	1514.9043	1002.5668	648.3600	681.9200	1081.6621	1637.7807	2158.2072	2598.6440	(97)
Space heating kWh	1187.9457	885.0136	686.5280	334.1526	127.0428	0.0000	0.0000	0.0000	0.0000	401.0981	823.6705	1218.1026	(98a)
Space heating requirement - total per year (kWh/year)												5663.5539	
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	1187.9457	885.0136	686.5280	334.1526	127.0428	0.0000	0.0000	0.0000	0.0000	401.0981	823.6705	1218.1026	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												5663.5539	
Space heating per m2										(98c) / (4) =		29.1936	(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 %)													88.8000 (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	1187.9457	885.0136	686.5280	334.1526	127.0428	0.0000	0.0000	0.0000	0.0000	401.0981	823.6705	1218.1026	(98)
Space heating efficiency (main heating system 1)	88.8000	88.8000	88.8000	88.8000	88.8000	0.0000	0.0000	0.0000	0.0000	88.8000	88.8000	88.8000	(210)
Space heating fuel (main heating system)	1337.7767	996.6369	773.1171	376.2979	143.0663	0.0000	0.0000	0.0000	0.0000	451.6871	927.5569	1371.7371	(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	257.5852	227.6438	241.6662	212.3051	205.6328	185.1308	182.6954	190.1048	192.3420	214.6524	228.4233	254.7704	(64)
Efficiency of water heater (217)m	87.0505	86.7972	86.2669	85.0724	83.0130	79.8000	79.8000	79.8000	79.8000	85.4408	86.6776	79.8000	(216)
Fuel for water heating, kWh/month	295.9030	262.2710	280.1379	249.5583	247.7116	231.9935	228.9416	238.2265	241.0301	251.2294	263.5322	292.5007	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	47.4449	38.0620	34.2707	25.1082	19.3943	15.8453	17.6921	22.9968	29.8706	39.1919	44.2671	48.7635	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-94.3924	-127.5184	-175.0190	-184.9398	-188.1247	-171.2128	-168.8209	-164.7581	-155.4165	-140.5036	-101.4758	-82.0062	(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	-79.7294	-170.9790	-351.0062	-540.0534	-720.7851	-726.7873	-715.5299	-599.8731	-430.0571	-246.2187	-106.7051	-62.5474	(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												6377.8760	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												79.8000	

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Water heating fuel used	3083.0359 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
central heating pump	41.0000 (230c)
main heating flue fan	45.0000 (230e)
Total electricity for the above, kWh/year	86.0000 (231)
Electricity for lighting (calculated in Appendix L)	382.9074 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-6504.4600 (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	3425.3592 (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	6377.8760	0.2100	1339.3540 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3083.0359	0.2100	647.4375 (264)
Space and water heating			1986.7915 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	382.9074	0.1443	55.2654 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1754.1883	0.1359	-238.3424
PV Unit electricity exported	-4750.2717	0.1253	-595.4444
Total			-833.7868 (269)
Total CO2, kg/year			1220.1993 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			6.2900 (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	6377.8760	1.1300	7206.9999 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3083.0359	1.1300	3483.8305 (278)
Space and water heating			10690.8304 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	382.9074	1.5338	587.3162 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1754.1883	1.5022	-2635.1942
PV Unit electricity exported	-4750.2717	0.4601	-2185.5956
Total			-4820.7897 (283)
Total Primary energy kWh/year			6587.4576 (286)
Dwelling Primary energy Rate (DPER)			33.9600 (287)

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

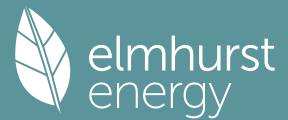
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	95.1000 (1b)	x 2.4000 (2b)	= 228.2400 (1b) - (3b)
First floor	64.8000 (1c)	x 2.6000 (2c)	= 168.4800 (1c) - (3c)
Second floor	34.1000 (1d)	x 2.7000 (2d)	= 92.0700 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	194.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 488.7900 (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	Air changes per hour
Pressure test	40.0000 / (5) = 0.0818 (8)
Pressure Test Method	Yes
Measured/design AP50	Blower Door
Infiltration rate	5.0000 (17)
Number of sides sheltered	0.3318 (18)
	1 (19)

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Shelter factor
Infiltration rate adjusted to include shelter factor

$$(20) = 1 - [0.075 \times (19)] = 0.9250 \quad (20)$$

$$(21) = (18) \times (20) = 0.3069 \quad (21)$$

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													
Effective ac	0.3914	0.3837	0.3760	0.3376	0.3300	0.2916	0.2916	0.2839	0.3069	0.3300	0.3453	0.3607	(22b)
	0.5766	0.5736	0.5707	0.5570	0.5544	0.5425	0.5425	0.5403	0.5471	0.5544	0.5596	0.5650	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			1.8900	1.0000	1.8900			(26)
TER Opening Type			20.1900	1.1450	23.1183			(27)
TER Roof Window			8.8800	1.1450	13.8814			(27a)
Heat Loss Floor			95.1000	0.1300	12.3630			(28a)
Cavity Wall	144.3000	22.0800	122.2200	0.1800	21.9996			(29a)
Stud Wall	28.1000		28.1000	0.1800	5.0580			(29a)
Flat Roof	23.5000	6.0000	17.5000	0.1100	1.9250			(30)
Plane Roof	60.6000		60.6000	0.1100	6.6660			(30)
Slope Roof	13.4000	2.8800	10.5200	0.1100	1.1572			(30)
Total net area of external elements Aum(A, m2)			365.0000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	88.0585			(33)
Main dwelling								
Party Wall			72.7000	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 111.7556 (35)

List of Thermal Bridges

	Length	Psi-value	Total	
K1 Element	16.2000	0.0500	0.8100	
E2 Other lintels (including other steel lintels)	15.3000	0.0500	0.7650	
E3 Sill	33.0000	0.0500	1.6500	
E4 Jamb	28.1000	0.1600	4.4960	
E5 Ground floor (normal)	42.9000	0.0000	0.0000	
E6 Intermediate floor within a dwelling	15.4000	0.0900	1.3860	
E16 Corner (normal)	15.4000	0.0600	0.9240	
E18 Party wall between dwellings	6.2000	0.0800	0.4960	
R1 Head of roof window	6.2000	0.0600	0.3720	
R2 Sill of roof window	11.2000	0.0800	0.8960	
R3 Jamb of roof window				

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 11.7950 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 99.8535 (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	93.0028	92.5232	92.0530	89.8447	89.4315	87.5081	87.5081	87.1519	88.2489	89.4315	90.2673	91.1412	(38)
Heat transfer coeff	192.8563	192.3767	191.9065	189.6982	189.2850	187.3616	187.3616	187.0054	188.1025	189.2850	190.1208	190.9947	(39)
Average = Sum(39)m / 12 =												189.6962	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9941	0.9916	0.9892	0.9778	0.9757	0.9658	0.9658	0.9639	0.9696	0.9757	0.9800	0.9845	(40)
HLP (average)												0.9778	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.9941 (42)
Hot water usage for mixer showers													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths													
85.8552	84.5801	82.7846	79.4739	76.9949	74.2460	72.7612	74.5442	76.4856	79.4270	82.8058	85.5650		(42b)
Hot water usage for other uses													
45.2927	43.6457	41.9987	40.3516	38.7046	37.0576	37.0576	38.7046	40.3516	41.9987	43.6457	45.2927		(42c)
Average daily hot water use (litres/day)												120.7765	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	131.1479	128.2258	124.7832	119.8255	115.6995	111.3037	109.8189	113.2489	116.8373	121.4256	126.4515	130.8576	(44)
Energy conte	207.7062	182.5918	191.7872	164.0351	155.7538	136.8608	132.8164	140.2258	144.0720	164.7734	180.1533	204.8914	(45)
Energy content (annual)										Total = Sum(45)m =		2005.6673	
Distribution loss (46)m = 0.15 x (45)m	31.1559	27.3888	28.7681	24.6053	23.3631	20.5291	19.9225	21.0339	21.6108	24.7160	27.0230	30.7337	(46)

Water storage loss:

Store volume 300.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 2.1127 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 1.1409 (55)

Total storage loss

35.3664	31.9439	35.3664	34.2256	35.3664	34.2256	35.3664	35.3664	34.2256	35.3664	34.2256	35.3664	35.3664	(56)
If cylinder contains dedicated solar storage													
35.3664	31.9439	35.3664	34.2256	35.3664	34.2256	35.3664	35.3664	34.2256	35.3664	34.2256	35.3664	35.3664	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	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	(61)
Total heat required for water heating calculated for each month													
266.3350	235.5469	250.4160	220.7727	214.3826	193.5984	191.4452	198.8546	200.8096	223.4022	236.8909	263.5202		(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h 266.3350 235.5469 250.4160 220.7727 214.3826 193.5984 191.4452 198.8546 200.8096 223.4022 236.8909 263.5202 (64)

Total per year (kWh/year) = Sum(64)m = 2695.9743 (64)

Electric shower(s) 2696 (64)

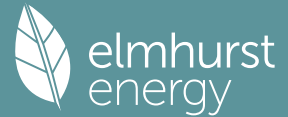
12Total per year (kWh/year)

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

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

Heat gains from water heating, kWh/month 115.9654 103.0758 110.6723 99.9317 98.6912 90.8963 91.0645 93.5281 93.2940 101.6902 105.2910 115.0294 (65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	149.7054	149.7054	149.7054	149.7054	149.7054	149.7054	149.7054	149.7054	149.7054	149.7054	149.7054	149.7054	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	192.4157	213.0317	192.4157	198.8295	192.4157	198.8295	192.4157	192.4157	198.8295	192.4157	198.8295	192.4157	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	365.3068	369.0975	359.5450	339.2087	313.5379	289.4109	273.2926	269.5019	279.0544	299.3906	325.0615	349.1885	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.9705	37.9705	37.9705	37.9705	37.9705	37.9705	37.9705	37.9705	37.9705	37.9705	37.9705	37.9705	(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)	-119.7643	-119.7643	-119.7643	-119.7643	-119.7643	-119.7643	-119.7643	-119.7643	-119.7643	-119.7643	-119.7643	-119.7643	(71)
Water heating gains (Table 5)	155.8674	153.3866	148.7531	138.7941	132.6494	126.2448	122.3985	125.7098	129.5750	136.6804	146.2375	154.6095	(72)
Total internal gains	784.5015	806.4274	771.6254	747.7440	709.5146	682.3969	656.0185	655.5390	675.3706	699.3984	741.0402	767.1253	(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

Northeast					10.6800	11.2829	0.6300	0.7000				0.7700			36.8269 (75)
Southeast					2.6400	36.7938	0.6300	0.7000				0.7700			29.6859 (77)
Southwest					6.8700	36.7938	0.6300	0.7000				0.7700			77.2509 (79)
Northeast					2.1600	17.4137	0.6300	0.7000				1.0000			14.9288 (82)
Southwest					0.7200	38.2331	0.6300	0.7000				1.0000			10.9258 (82)
Horizontal					6.0000	26.0000	0.6300	0.7000				1.0000			61.9164 (82)

Solar gains		231.5348	437.3946	703.2368	1031.5165	1290.4024	1337.4755	1266.2161	1066.4271	816.9114	512.5774	285.3862			192.8055 (83)
Total gains		1016.0363	1243.8220	1474.8621	1779.2605	1999.9171	2019.8724	1922.2345	1721.9661	1492.2820	1211.9758	1026.4264			959.9308 (84)

7. Mean internal temperature (heating season)

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

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	31.2273	31.3052	31.3819	31.7472	31.8165	32.1431	32.1431	32.2043	32.0165	31.8165	31.6766	31.5317	21.0000 (85)
alpha	3.0818	3.0870	3.0921	3.1165	3.1211	3.1429	3.1429	3.1470	3.1344	3.1211	3.1118	3.1021	
util living area	0.9803	0.9633	0.9287	0.8435	0.7071	0.5407	0.4112	0.4697	0.7029	0.9022	0.9671	0.9833	(86)
MIT	18.6999	19.0349	19.5367	20.1739	20.6397	20.8883	20.9646	20.9464	20.7404	20.0895	19.2858	18.6508	(87)
Th 2	20.0882	20.0903	20.0923	20.1019	20.1036	20.1119	20.1119	20.1135	20.1087	20.1036	20.1000	20.0963	(88)
util rest of house	0.9771	0.9576	0.9175	0.8196	0.6650	0.4789	0.3345	0.3891	0.6448	0.8816	0.9610	0.9806	(89)
MIT 2	17.3658	17.7917	18.4242	19.2124	19.7554	20.0244	20.0918	20.0809	19.8839	19.1286	18.1202	17.3081	(90)
Living area fraction	17.8781	18.2691	18.8514	19.5817	20.0950	20.3562	20.4269	20.4132	20.2128	19.4976	18.5678	17.8237	(92)
MIT	17.8781	18.2691	18.8514	19.5817	20.0950	20.3562	20.4269	20.4132	20.2128	19.4976	18.5678	17.8237	(93)
Temperature adjustment												0.0000	
adjusted MIT	17.8781	18.2691	18.8514	19.5817	20.0950	20.3562	20.4269	20.4132	20.2128	19.4976	18.5678	17.8237	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9662	0.9422	0.8983	0.8038	0.6645	0.4965	0.3623	0.4172	0.6521	0.8647	0.9468	0.9709	(94)
Useful gains	981.7020	1171.9298	1324.8573	1430.2270	1328.9807	1002.9197	696.4085	718.4453	973.1545	1048.0412	971.8614	931.9922	(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	2618.6312	2571.9055	2370.3155	2026.2908	1589.0498	1078.4861	717.0216	750.4943	1149.8393	1684.1766	2180.2682	2602.0542	(97)
Space heating kWh	1217.8753	940.7837	777.8209	429.1660	193.4914	0.0000	0.0000	0.0000	0.0000	473.2847	870.0529	1242.5261	(98a)
Space heating requirement - total per year (kWh/year)												6145.0009	
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	1217.8753	940.7837	777.8209	429.1660	193.4914	0.0000	0.0000	0.0000	0.0000	473.2847	870.0529	1242.5261	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												6145.0009	
Space heating per m2										(98c) / (4) =		31.6753	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)

Fraction of space heat from main system(s)

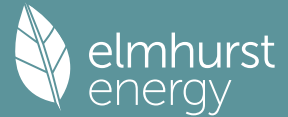
Efficiency of main space heating system 1 (in %)

Efficiency of main space heating system 2 (in %)

Efficiency of secondary/supplementary heating system, %

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	1217.8753	940.7837	777.8209	429.1660	193.4914	0.0000	0.0000	0.0000	0.0000	473.2847	870.0529	1242.5261	(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)	1319.4748	1019.2673	842.7095	464.9685	209.6331	0.0000	0.0000	0.0000	0.0000	512.7679	942.6359	1346.1821	(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)

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Water heating													
Water heating requirement	266.3350	235.5469	250.4160	220.7727	214.3826	193.5984	191.4452	198.8546	200.8096	223.4022	236.8909	263.5202	(64)
Efficiency of water heater												79.8000	(216)
(217)m	87.0385	86.8389	86.4261	85.5236	83.8306	79.8000	79.8000	79.8000	79.8000	85.7006	86.7072	87.0815	(217)
Fuel for water heating, kWh/month	305.9968	271.2458	289.7456	258.1425	255.7331	242.6045	239.9063	249.1912	251.6411	260.6775	273.2077	302.6132	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	39.9802	32.0736	28.8787	21.1578	16.3429	13.3523	14.9085	19.3787	25.1710	33.0257	37.3024	41.0914	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-80.2889	-109.0174	-150.9099	-163.0780	-170.3071	-156.8039	-154.6276	-148.4923	-137.1306	-121.2267	-86.6691	-69.8934	(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	-58.9562	-122.1750	-239.6078	-355.4101	-465.8496	-466.7983	-461.5147	-392.7960	-290.4946	-173.4574	-78.2682	-46.7829	(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												6657.6391	(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												3200.7053	(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)												322.6629	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-4700.5558	(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												5566.4516	(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	6657.6391	0.2100	1398.1042	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3200.7053	0.2100	672.1481	(264)
Space and water heating			2070.2523	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	322.6629	0.1443	46.5702	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1548.4450	0.1354	-209.7275	
PV Unit electricity exported	-3152.1108	0.1263	-397.9775	
Total			-607.7049	(269)
Total CO2, kg/year			1521.0469	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			7.8400	(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	6657.6391	1.1300	7523.1322	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3200.7053	1.1300	3616.7970	(278)
Space and water heating			11139.9292	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	322.6629	1.5338	494.9112	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1548.4450	1.5006	-2323.6360	
PV Unit electricity exported	-3152.1108	0.4635	-1460.8993	
Total			-3784.5353	(283)
Total Primary energy kWh/year			7980.4059	(286)
Target Primary Energy Rate (TPER)			41.1400	(287)

Full SAP Calculation Printout



Property Reference	Plot 2 7HR				Issued on Date	28/03/2025	
Assessment Reference	Plot 2- Gas boiler			Prop Type Ref	RHS Plot		
Property	Plot 2, 7 Hawthorne Road, READING, RG4 6LY						
SAP Rating	101 A		DER	6.29	TER	7.84	
Environmental	93 A		% DER < TER				19.77
CO ₂ Emissions (t/year)	0.97		DFEE	33.56	TFEE	36.41	
Compliance Check	See BREL		% DFEE < TFEE				7.81
% DPER < TPER	17.46		DPER	33.96	TPER	41.14	
Assessor Details	Mr. Dhiraj Karsan				Assessor ID	M078-0001	
Client							

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	95.1000 (1b)	x 2.4000 (2b)	= 228.2400 (1b) - (3b)
First floor	64.8000 (1c)	x 2.6000 (2c)	= 168.4800 (1c) - (3c)
Second floor	34.1000 (1d)	x 2.7000 (2d)	= 92.0700 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	194.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 488.7900 (5)

2. Ventilation rate

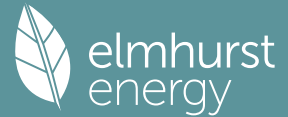
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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) = 0.0818 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3318 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3069 (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	0.3914	0.3837	0.3760	0.3376	0.3300	0.2916	0.2916	0.2839	0.3069	0.3300	0.3453	0.3607 (22b)
Effective ac	0.5766	0.5736	0.5707	0.5570	0.5544	0.5425	0.5425	0.5403	0.5471	0.5544	0.5596	0.5650 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Windows			20.1900	1.1450	23.1183		(27)
Roof Windows			8.8800	1.1450	10.1679		(27a)
Door			1.8900	1.2000	2.2680		(26)
Heat Loss Floor			95.1000	0.1100	10.4610	110.0000	10461.0000 (28a)
Cavity Wall	144.3000	22.0800	122.2200	0.1800	21.9996	60.0000	7333.2000 (29a)
Stud Wall	28.1000		28.1000	0.1100	3.0910	9.0000	252.9000 (29a)
Flat Roof	23.5000	6.0000	17.5000	0.1400	2.4500	9.0000	157.5000 (30)
Plane Roof	60.6000		60.6000	0.1132	6.8604	9.0000	545.4000 (30)
Slope Roof	13.4000	2.8800	10.5200	0.1300	1.3676	9.0000	94.6800 (30)
Total net area of external elements Aum(A, m ²)			365.0000				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		81.7838		(33)
Main dwelling							
Party Wall			72.7000	0.0000	0.0000	0.0000	0.0000 (32)
Internal Wall			216.2000			9.0000	1945.8000 (32c)
Internal Ceiling			64.8000			9.0000	583.2000 (32e)
Internal Ceiling 2			34.1000			9.0000	306.9000 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	21680.5800 (34)

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Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K												111.7556 (35)
List of Thermal Bridges												
K1 Element								Length	Psi-value	Total		
E2 Other lintels (including other steel lintels)								16.2000	0.0400	0.6480		
E3 Sill								15.3000	0.0300	0.4590		
E4 Jamb								33.0000	0.0300	0.9900		
E5 Ground floor (normal)								28.1000	0.0600	1.6860		
E6 Intermediate floor within a dwelling								42.9000	0.0700	3.0030		
E16 Corner (normal)								15.4000	0.0900	1.3860		
E18 Party wall between dwellings								15.4000	0.0600	0.9240		
R1 Head of roof window								6.2000	0.0800	0.4960		
R2 Sill of roof window								6.2000	0.0600	0.3720		
R3 Jamb of roof window								11.2000	0.0800	0.8960		
Thermal bridges (Sum(L x Psi) calculated using Appendix K)										10.8600	(36)	
Point Thermal Bridges										(36a) =	0.0000	
Total fabric heat loss										(33) + (36) + (36a) =	92.6438	(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	93.0028	92.5232	92.0530	89.8447	89.4315	87.5081	87.5081	87.1519	88.2489	89.4315	90.2673	91.1412 (38)
Average = Sum(39)m / 12 =	185.6467	185.1670	184.6968	182.4885	182.0753	180.1519	180.1519	179.7957	180.8928	182.0753	182.9112	183.7850 (39)
												182.4865
HLP	0.9569	0.9545	0.9520	0.9407	0.9385	0.9286	0.9286	0.9268	0.9324	0.9385	0.9428	0.9473 (40)
HLP (average)												0.9407
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.9941 (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	(42a)
Hot water usage for baths	85.8552	84.5801	82.7846	79.4739	76.9949	74.2460	72.7612	74.5442	76.4856	79.4270	82.8058	85.5650 (42b)
Hot water usage for other uses	45.2927	43.6457	41.9987	40.3516	38.7046	37.0576	37.0576	38.7046	40.3516	41.9987	43.6457	45.2927 (42c)
Average daily hot water use (litres/day)												120.7765 (43)
Daily hot water use	131.1479	128.2258	124.7832	119.8255	115.6995	111.3037	109.8189	113.2489	116.8373	121.4256	126.4515	130.8576 (44)
Energy conte	207.7062	182.5918	191.7872	164.0351	155.7538	136.8608	132.8164	140.2258	144.0720	164.7734	180.1533	204.8914 (45)
Energy content (annual)										Total = Sum(45)m =		2005.6673
Distribution loss (46)m = 0.15 x (45)m	31.1559	27.3888	28.7681	24.6053	23.3631	20.5291	19.9225	21.0339	21.6108	24.7160	27.0230	30.7337 (46)
Water storage loss:												
Store volume												300.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5900 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.8586 (55)
Total storage loss	26.6166	24.0408	26.6166	25.7580	26.6166	25.7580	26.6166	26.6166	25.7580	26.6166	25.7580	26.6166 (56)
If cylinder contains dedicated solar storage	26.6166	24.0408	26.6166	25.7580	26.6166	25.7580	26.6166	26.6166	25.7580	26.6166	25.7580	26.6166 (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	257.5852	227.6438	241.6662	212.3051	205.6328	185.1308	182.6954	190.1048	192.3420	214.6524	228.4233	254.7704 (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	257.5852	227.6438	241.6662	212.3051	205.6328	185.1308	182.6954	190.1048	192.3420	214.6524	228.4233	254.7704 (64)
								Total per year (kWh/year) = Sum(64)m =				2592.9523 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
												0.0000 (64a)
Heat gains from water heating, kWh/month	108.9655	96.7534	103.6724	93.1577	91.6913	84.1222	84.0647	86.5283	86.5199	94.6904	98.5170	108.0296 (65)

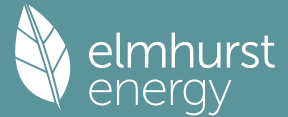
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	179.6465	179.6465	179.6465	179.6465	179.6465	179.6465	179.6465	179.6465	179.6465	179.6465	179.6465	179.6465 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	54.2045	48.1440	39.1533	29.6416	22.1574	18.7062	20.2127	26.2733	35.2639	44.7757	52.2598	55.7110 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	545.2340	550.8918	536.6343	506.2817	467.9670	431.9566	407.8994	402.2416	416.4991	446.8517	485.1664	521.1768 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.9588	55.9588	55.9588	55.9588	55.9588	55.9588	55.9588	55.9588	55.9588	55.9588	55.9588	55.9588 (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)	-119.7643	-119.7643	-119.7643	-119.7643	-119.7643	-119.7643	-119.7643	-119.7643	-119.7643	-119.7643	-119.7643	-119.7643 (71)
Water heating gains (Table 5)	146.4590	143.9782	139.3447	129.3857	123.2410	116.8364	112.9901	116.3014	120.1666	127.2720	136.8291	145.2011 (72)
Total internal gains	864.7384	861.8550	833.9732	784.1499	732.2064	683.3402	656.9432	660.6572	687.7706	737.7403	793.0963	840.9299 (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
Northeast	10.6800	11.2829	0.7600	0.7000	0.7700	44.4261 (75)
Southeast	2.6400	36.7938	0.7600	0.7000	0.7700	35.8116 (77)
Southwest	6.8700	36.7938	0.7600	0.7000	0.7700	93.1916 (79)

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Northeast	2.1600	17.4137	0.7600	0.7000	1.0000	18.0094 (82)
Southwest	0.7200	38.2331	0.7600	0.7000	1.0000	13.1803 (82)
Horizontal	6.0000	26.0000	0.7600	0.7000	1.0000	74.6928 (82)

Solar gains	279.3118	527.6506	848.3491	1244.3691	1556.6759	1613.4625	1527.4988	1286.4834	985.4804	618.3474	344.2754	232.5908 (83)
Total gains	1144.0503	1389.5056	1682.3223	2028.5190	2288.8823	2296.8027	2184.4420	1947.1407	1673.2510	1356.0877	1137.3717	1073.5206 (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	32.4400	32.5241	32.6069	33.0014	33.0763	33.4295	33.4295	33.4957	33.2926	33.0763	32.9252	32.7686
alpha	3.1627	3.1683	3.1738	3.2001	3.2051	3.2286	3.2286	3.2330	3.2195	3.2051	3.1950	3.1846
util living area	0.9726	0.9504	0.9007	0.7932	0.6378	0.4734	0.3540	0.4090	0.6420	0.8709	0.9562	0.9772 (86)
MIT	19.3418	19.5977	19.9884	20.4307	20.7196	20.8527	20.8894	20.8805	20.7667	20.3409	19.7556	19.2971 (87)
Th 2	20.1194	20.1214	20.1235	20.1331	20.1349	20.1432	20.1432	20.1448	20.1400	20.1349	20.1312	20.1274 (88)
util rest of house	0.9684	0.9431	0.8865	0.7659	0.5954	0.4176	0.2883	0.3384	0.5841	0.8465	0.9485	0.9736 (89)
MIT 2	18.1516	18.4758	18.9646	19.5068	19.8364	19.9808	20.0123	20.0081	19.9004	19.4153	18.6865	18.1007 (90)
Living area fraction	18.6087	18.9067	19.3578	19.8616	20.1755	20.3156	20.3491	20.3431	20.2331	19.7708	19.0970	18.5601 (92)
Temperature adjustment	18.4587	18.7567	19.2078	19.7116	20.0255	20.1656	20.1991	20.1931	20.0831	19.6208	18.9470	-0.1500
adjusted MIT												18.4101 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9580	0.9288	0.8689	0.7512	0.5897	0.4191	0.2927	0.3425	0.5800	0.8294	0.9351	0.9644 (94)
Useful gains	1096.0132	1290.5783	1461.7879	1523.8881	1349.8653	962.5681	639.3016	666.8991	970.5036	1124.7998	1063.5191	1035.3281 (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	2628.5066	2565.7958	2347.0875	1972.9939	1515.8729	1002.6594	648.3869	681.9869	1082.2930	1642.4563	2166.9508	2611.6081 (97)
Space heating kWh	1140.1751	856.9462	658.6629	323.3562	123.5096	0.0000	0.0000	0.0000	0.0000	385.1364	794.4709	1172.7523 (98a)
Space heating requirement - total per year (kWh/year)												5455.0097
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	1140.1751	856.9462	658.6629	323.3562	123.5096	0.0000	0.0000	0.0000	0.0000	385.1364	794.4709	1172.7523 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												5455.0097
Space heating per m2										(98c) / (4) =		28.1186 (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 %)												88.8000 (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	1140.1751	856.9462	658.6629	323.3562	123.5096	0.0000	0.0000	0.0000	0.0000	385.1364	794.4709	1172.7523 (98)
Space heating efficiency (main heating system 1)	88.8000	88.8000	88.8000	88.8000	88.8000	0.0000	0.0000	0.0000	0.0000	88.8000	88.8000	88.8000 (210)
Space heating fuel (main heating system)	1283.9809	965.0295	741.7375	364.1399	139.0874	0.0000	0.0000	0.0000	0.0000	433.7122	894.6744	1320.6670 (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	257.5852	227.6438	241.6662	212.3051	205.6328	185.1308	182.6954	190.1048	192.3420	214.6524	228.4233	254.7704 (64)
Efficiency of water heater (217)m	86.9920	86.7466	86.1908	85.0005	82.9549	79.8000	79.8000	79.8000	79.8000	85.3549	86.6185	79.8000 (216)
Fuel for water heating, kWh/month	296.1023	262.4240	280.3853	249.7694	247.8849	231.9935	228.9416	238.2265	241.0301	251.4823	263.7120	292.6785 (219)
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	47.4449	38.0620	34.2707	25.1082	19.3943	15.8453	17.6921	22.9968	29.8706	39.1919	44.2671	48.7635 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-94.3924	-127.5184	-175.0190	-184.9398	-188.1247	-171.2128	-168.8209	-164.7581	-155.4165	-140.5036	-101.4758	-82.0062 (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	-79.7294	-170.9790	-351.0062	-540.0534	-720.7851	-726.7873	-715.5299	-599.8731	-430.0571	-246.2187	-106.7051	-62.5474 (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												6143.0289 (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												3084.6305 (219)

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Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
central heating pump	41.0000 (230c)
main heating flue fan	45.0000 (230e)
Total electricity for the above, kWh/year	86.0000 (231)
Electricity for lighting (calculated in Appendix L)	382.9074 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-6504.4600 (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	3192.1067 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	6143.0289	3.6400	223.6063 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3084.6305	3.6400	112.2805 (247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000 (247a)
Pumps, fans and electric keep-hot	86.0000	16.4900	14.1814 (249)
Energy for lighting	382.9074	16.4900	63.1414 (250)
Additional standing charges			92.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1754.1883	16.4900	-289.2656
PV Unit electricity exported	-4750.2717	5.5900	-265.5402
Total			-554.8058 (252)
Total energy cost			-49.5962 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	-0.0747 (257)
SAP value		101.2110
SAP rating (Section 12)		101 (258)
SAP band		A

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	6143.0289	0.2100	1290.0361 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3084.6305	0.2100	647.7724 (264)
Space and water heating			1937.8085 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	382.9074	0.1443	55.2654 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1754.1883	0.1359	-238.3424
PV Unit electricity exported	-4750.2717	0.1253	-595.4444
Total			-833.7868 (269)
Total CO2, kg/year			1171.2163 (272)
CO2 emissions per m2			6.0400 (273)
EI value			93.4333
EI rating			93 (274)
EI band			A

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

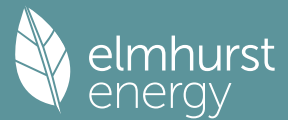
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	95.1000 (1b)	x 2.4000 (2b)	= 228.2400 (1b) - (3b)
First floor	64.8000 (1c)	x 2.6000 (2c)	= 168.4800 (1c) - (3c)
Second floor	34.1000 (1d)	x 2.7000 (2d)	= 92.0700 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	194.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	488.7900 (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)

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Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	4 * 10 =	40.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.0818 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3318 (18)
Number of sides sheltered	1	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3069 (21)

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	4.6000	4.4000	4.4000	4.1000	4.1000	3.7000	3.7000	3.5000	3.8000	4.2000	4.0000	4.3000 (22)
Adj infilt rate	1.1500	1.1000	1.1000	1.0250	1.0250	0.9250	0.9250	0.8750	0.9500	1.0500	1.0000	1.0750 (22a)
Effective ac	0.3530	0.3376	0.3376	0.3146	0.3146	0.2839	0.2839	0.2686	0.2916	0.3223	0.3069	0.3300 (22b)
	0.5623	0.5570	0.5570	0.5495	0.5495	0.5403	0.5403	0.5361	0.5425	0.5519	0.5471	0.5544 (25)

3. Heat losses and heat loss parameter

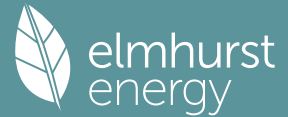
Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Main dwelling							
Windows			20.1900	1.1450	23.1183		(27)
Roof Windows			8.8800	1.1450	10.1679		(27a)
Door			1.8900	1.2000	2.2680		(26)
Heat Loss Floor			95.1000	0.1100	10.4610	110.0000	10461.0000 (28a)
Cavity Wall	144.3000	22.0800	122.2200	0.1800	21.9996	60.0000	7333.2000 (29a)
Stud Wall	28.1000		28.1000	0.1100	3.0910	9.0000	252.9000 (29a)
Flat Roof	23.5000	6.0000	17.5000	0.1400	2.4500	9.0000	157.5000 (30)
Plane Roof	60.6000		60.6000	0.1132	6.8604	9.0000	545.4000 (30)
Slope Roof	13.4000	2.8800	10.5200	0.1300	1.3676	9.0000	94.6800 (30)
Total net area of external elements Aum(A, m2)			365.0000				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		81.7838		(33)
Main dwelling							
Party Wall			72.7000	0.0000	0.0000	0.0000	0.0000 (32)
Internal Wall			216.2000			9.0000	1945.8000 (32c)
Internal Ceiling			64.8000			9.0000	583.2000 (32e)
Internal Ceiling 2			34.1000			9.0000	306.9000 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	21680.5800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							111.7556 (35)

List of Thermal Bridges												
K1 Element												
E2 Other lintels (including other steel lintels)												
E3 Sill												
E4 Jamb												
E5 Ground floor (normal)												
E6 Intermediate floor within a dwelling												
E16 Corner (normal)												
E18 Party wall between dwellings												
R1 Head of roof window												
R2 Sill of roof window												
R3 Jamb of roof window												
Thermal bridges (Sum(L x Psi) calculated using Appendix K)												
Point Thermal Bridges												
Total fabric heat loss												
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	90.6995	89.8447	89.8447	88.6336	88.6336	87.1519	87.1519	86.4680	87.5081	89.0278	88.2489	89.4315 (38)
Average = Sum(39)m / 12 =	183.3433	182.4885	182.4885	181.2775	181.2775	179.7957	179.7957	179.1119	180.1519	181.6716	180.8928	182.0753 (39)
												181.1975
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.9451	0.9407	0.9407	0.9344	0.9344	0.9268	0.9268	0.9233	0.9286	0.9365	0.9324	0.9385 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.9941 (42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42a)
Hot water usage for baths	85.8552	84.5801	82.7846	79.4739	76.9949	74.2460	72.7612	74.5442	76.4856	79.4270	82.8058	85.5650	(42b)
Hot water usage for other uses	45.2927	43.6457	41.9987	40.3516	38.7046	37.0576	37.0576	38.7046	40.3516	41.9987	43.6457	45.2927	(42c)
Average daily hot water use (litres/day)													120.7765 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	131.1479	128.2258	124.7832	119.8255	115.6995	111.3037	109.8189	113.2489	116.8373	121.4256	126.4515	130.8576	(44)
Energy content (annual)	207.7062	182.5918	191.7872	164.0351	155.7538	136.8608	132.8164	140.2258	144.0720	164.7734	180.1533	204.8914	(45)
Distribution loss (46)m = 0.15 x (45)m	31.1559	27.3888	28.7681	24.6053	23.3631	20.5291	19.9225	21.0339	21.6108	24.7160	27.0230	30.7337	(46)
Water storage loss:													
Store volume													300.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.5900 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.8586 (55)
Total storage loss	26.6166	24.0408	26.6166	25.7580	26.6166	25.7580	26.6166	26.6166	25.7580	26.6166	25.7580	26.6166	(56)
If cylinder contains dedicated solar storage	26.6166	24.0408	26.6166	25.7580	26.6166	25.7580	26.6166	26.6166	25.7580	26.6166	25.7580	26.6166	(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)

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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	257.5852	227.6438	241.6662	212.3051	205.6328	185.1308	182.6954	190.1048	192.3420	214.6524	228.4233	254.7704 (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	257.5852	227.6438	241.6662	212.3051	205.6328	185.1308	182.6954	190.1048	192.3420	214.6524	228.4233	254.7704 (64)
	Total per year (kWh/year) = Sum(64)m =											2592.9523 (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	108.9655	96.7534	103.6724	93.1577	91.6913	84.1222	84.0647	86.5283	86.5199	94.6904	98.5170	108.0296 (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	179.6465	179.6465	179.6465	179.6465	179.6465	179.6465	179.6465	179.6465	179.6465	179.6465	179.6465	179.6465	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	54.2045	48.1440	39.1533	29.6416	22.1574	18.7062	20.2127	26.2733	35.2639	44.7757	52.2598	55.7110	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	545.2340	550.8918	536.6343	506.2817	467.9670	431.9566	407.8994	402.2416	416.4991	446.8517	485.1664	521.1768	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.9588	55.9588	55.9588	55.9588	55.9588	55.9588	55.9588	55.9588	55.9588	55.9588	55.9588	55.9588	(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)	-119.7643	-119.7643	-119.7643	-119.7643	-119.7643	-119.7643	-119.7643	-119.7643	-119.7643	-119.7643	-119.7643	-119.7643	(71)
Water heating gains (Table 5)	146.4590	143.9782	139.3447	129.3857	123.2410	116.8364	112.9901	116.3014	120.1666	127.2720	136.8291	145.2011	(72)
Total internal gains	864.7384	861.8550	833.9732	784.1499	732.2064	683.3402	656.9432	660.6572	687.7706	737.7403	793.0963	840.9299	(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				
Northeast				10.6800	13.7804	0.7600	0.7000	0.7700	54.2598 (75)				
Southeast				2.6400	43.0593	0.7600	0.7000	0.7700	41.9098 (77)				
Southwest				6.8700	43.0593	0.7600	0.7000	0.7700	109.0607 (79)				
Northeast				2.1600	21.4042	0.7600	0.7000	1.0000	22.1364 (82)				
Southwest				0.7200	45.8318	0.7600	0.7000	1.0000	15.7999 (82)				
Horizontal				6.0000	32.0000	0.7600	0.7000	1.0000	91.9296 (82)				
Solar gains	335.0962	554.8633	880.1474	1326.5458	1609.0552	1764.3748	1653.6662	1427.0465	1093.4612	689.7421	397.0693	280.4074	(83)
Total gains	1199.8347	1416.7183	1714.1206	2110.6956	2341.2616	2447.7150	2310.6094	2087.7038	1781.2318	1427.4824	1190.1656	1121.3372	(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	32.8476	33.0014	33.0014	33.2219	33.2219	33.4957	33.4957	33.6236	33.4295	33.1498	33.2926	33.0763	
alpha	3.1898	3.2001	3.2001	3.2148	3.2148	3.2330	3.2330	3.2416	3.2286	3.2100	3.2195	3.2051	
util living area	0.9667	0.9440	0.8871	0.7580	0.5925	0.3973	0.2842	0.3202	0.5806	0.8420	0.9458	0.9720	(86)
MIT	19.4616	19.6974	20.0871	20.5206	20.7683	20.8776	20.8981	20.8954	20.8106	20.4323	19.8761	19.4199	(87)
Th 2	20.1294	20.1331	20.1331	20.1383	20.1383	20.1448	20.1448	20.1478	20.1432	20.1366	20.1400	20.1349	(88)
util rest of house	0.9616	0.9357	0.8710	0.7272	0.5468	0.3409	0.2200	0.2507	0.5190	0.8128	0.9362	0.9677	(89)
MIT 2	18.3106	18.6100	19.0940	19.6159	19.8912	20.0038	20.0196	20.0213	19.9455	19.5250	18.8444	18.2621	(90)
Living area fraction	18.7526	19.0276	19.4754	19.9634	20.2280	20.3393	20.3570	20.3570	20.2777	19.8735	19.2406	18.7067	(91)
MIT	18.7526	19.0276	19.4754	19.9634	20.2280	20.3393	20.3570	20.3570	20.2777	19.8735	19.2406	18.7067	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.6026	18.8776	19.3254	19.8134	20.0780	20.1893	20.2070	20.2070	20.1277	19.7235	19.0906	18.5567	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9500	0.9209	0.8535	0.7146	0.5435	0.3439	0.2248	0.2556	0.5178	0.7966	0.9215	0.9573	(94)
Useful gains	1139.8762	1304.5992	1462.9275	1508.3075	1272.4654	841.8218	519.3478	533.6272	922.3737	1137.1892	1096.7906	1073.4411	(95)
Ext temp.	4.7000	5.3000	7.0000	9.5000	12.4000	15.4000	17.3000	17.2000	14.6000	11.1000	7.6000	4.7000	(96)
Heat loss rate W	2548.9534	2477.7507	2249.2380	1869.5783	1391.8516	861.1042	522.6645	538.5895	995.8335	1566.6372	2078.5694	2522.9604	(97)
Space heating kWh	1048.3534	788.3578	585.0151	260.1149	88.8233	0.0000	0.0000	0.0000	0.0000	319.5093	706.8808	1078.4423	(98a)
Space heating requirement - total per year (kWh/year)												4875.4969	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	1048.3534	788.3578	585.0151	260.1149	88.8233	0.0000	0.0000	0.0000	0.0000	319.5093	706.8808	1078.4423	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4875.4969	
Space heating per m2												25.1314	(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)

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Efficiency of main space heating system 1 (in %) 88.8000 (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	1048.3534	788.3578	585.0151	260.1149	88.8233	0.0000	0.0000	0.0000	0.0000	319.5093	706.8808	1078.4423	(98)
Space heating efficiency (main heating system 1)	88.8000	88.8000	88.8000	88.8000	88.8000	0.0000	0.0000	0.0000	0.0000	88.8000	88.8000	88.8000	(210)
Space heating fuel (main heating system)	1180.5781	887.7903	658.8007	292.9222	100.0263	0.0000	0.0000	0.0000	0.0000	359.8078	796.0369	1214.4621	(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	257.5852	227.6438	241.6662	212.3051	205.6328	185.1308	182.6954	190.1048	192.3420	214.6524	228.4233	254.7704	(64)
Efficiency of water heater	86.8676	86.6114	85.9657	84.5164	82.3167	79.8000	79.8000	79.8000	79.8000	84.9500	86.4197	86.9266	(216)
Fuel for water heating, kWh/month	296.5262	262.8337	281.1192	251.2000	249.8070	231.9935	228.9416	238.2265	241.0301	252.6810	264.3187	293.0870	(217)
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	(219)
(221)m	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685	(221)
Pumps and Fa	47.4449	38.0620	34.2707	25.1082	19.3943	15.8453	17.6921	22.9968	29.8706	39.1919	44.2671	48.7635	(221)
Lighting	-106.8259	-131.1324	-177.5319	-188.0654	-189.0562	-173.1318	-170.5146	-167.9128	-160.1709	-147.7596	-110.9400	-93.5754	(233a)
Electricity generated by PVs (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 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	(235a)
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	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)	-102.5042	-182.6448	-366.1039	-579.8240	-743.8249	-802.1384	-780.2109	-674.4367	-486.1314	-282.8780	-129.5007	-81.1667	(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												5490.4244	(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												3091.7646	(219)
Space cooling fuel												0.0000	(221)

Electricity for pumps and fans:
 central heating pump 41.0000 (230c)
 main heating flue fan 45.0000 (230e)
 Total electricity for the above, kWh/year 86.0000 (231)
 Electricity for lighting (calculated in Appendix L) 382.9074 (232)

Energy saving/generation technologies (Appendices M ,N and Q)
 PV generation -7027.9815 (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 2023.1150 (238)

10a. Fuel costs - using BEDF prices (567)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	5490.4244	5.6000	307.4638	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3091.7646	5.6000	173.1388	(247)
Energy for instantaneous electric shower(s)	0.0000	26.0600	0.0000	(247a)
Pumps, fans and electric keep-hot	86.0000	26.0600	22.4116	(249)
Energy for lighting	382.9074	26.0600	99.7857	(250)
Additional standing charges			99.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1816.6169	26.0600	-473.4104	
PV Unit electricity exported	-5211.3646	5.8100	-302.7803	
Total			-776.1907	(252)
Total energy cost			-74.3908	(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	5490.4244	0.2100	1152.9891	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3091.7646	0.2100	649.2706	(264)
Space and water heating			1802.2597	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	382.9074	0.1443	55.2654	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1816.6169	0.1363	-247.5550	
PV Unit electricity exported	-5211.3646	0.1254	-653.4438	
Total			-900.9988	(269)
Total CO2, kg/year			968.4556	(272)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	5490.4244	1.1300	6204.1796 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3091.7646	1.1300	3493.6940 (278)
Space and water heating			9697.8736 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	382.9074	1.5338	587.3162 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1816.6169	1.5037	-2731.6925
PV Unit electricity exported	-5211.3646	0.4602	-2398.1079
Total			-5129.8004 (283)
Total Primary energy kWh/year			5285.4902 (286)

SAP 10 EPC IMPROVEMENTS

Plot 2- Gas boiler

Current energy efficiency rating: A 101
Current environmental impact rating: A 93

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

Recommended measures: (none)	SAP change	Cost change	CO2 change
Measures omitted - SAP change or cost saving too small:			
N Solar water heating	+ 0.6	-£ 43	-212 kg (21.9%)

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

Potential energy efficiency rating: A 101
Potential environmental impact rating: A 93

Fuel prices for cost data on this page from database revision number 567 TEST (07 Mar 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

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

	Current	Potential	Saving
Electricity	£122	£122	£0
Mains gas	£580	£580	£0
Space heating	£429	£429	£0
Water heating	£173	£173	£0
Lighting	£100	£100	£0
Generated (PV)	-£776	-£776	£0
Total cost of fuels	-£74	-£74	£0
Total cost of uses	-£74	-£74	£0
Delivered energy	10 kWh/m²	10 kWh/m²	0 kWh/m²
Carbon dioxide emissions	1.0 tonnes	1.0 tonnes	0.0 tonnes
CO2 emissions per m²	5 kg/m²	5 kg/m²	0 kg/m²
Primary energy	27 kWh/m²	27 kWh/m²	0 kWh/m²

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

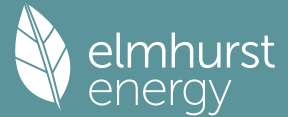
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	95.1000 (1b)	x 2.4000 (2b)	= 228.2400 (1b) - (3b)
First floor	64.8000 (1c)	x 2.6000 (2c)	= 168.4800 (1c) - (3c)
Second floor	34.1000 (1d)	x 2.7000 (2d)	= 92.0700 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	194.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 488.7900 (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
Number of intermittent extract fans
Number of passive vents
Number of flueless gas fires

0 * 20 = 0.0000 (6f)
4 * 10 = 40.0000 (7a)
0 * 10 = 0.0000 (7b)
0 * 40 = 0.0000 (7c)

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

Air changes per hour
40.0000 / (5) = 0.0818 (8)
Yes
Blower Door
5.0000 (17)
0.3318 (18)
1 (19)

Shelter factor (20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.3069 (21)

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000
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
Adj infilt rate												
Effective ac	0.3914	0.3837	0.3760	0.3376	0.3300	0.2916	0.2916	0.2839	0.3069	0.3300	0.3453	0.3607
	0.5766	0.5736	0.5707	0.5570	0.5544	0.5425	0.5425	0.5403	0.5471	0.5544	0.5596	0.5650

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Main dwelling							
Windows			20.1900	1.1450	23.1183		(27)
Roof Windows			8.8800	1.1450	10.1679		(27a)
Door			1.8900	1.2000	2.2680		(26)
Heat Loss Floor			95.1000	0.1100	10.4610	110.0000	10461.0000 (28a)
Cavity Wall	144.3000	22.0800	122.2200	0.1800	21.9996	60.0000	7333.2000 (29a)
Stud Wall	28.1000		28.1000	0.1100	3.0910	9.0000	252.9000 (29a)
Flat Roof	23.5000	6.0000	17.5000	0.1400	2.4500	9.0000	157.5000 (30)
Plane Roof	60.6000		60.6000	0.1132	6.8604	9.0000	545.4000 (30)
Slope Roof	13.4000	2.8800	10.5200	0.1300	1.3676	9.0000	94.6800 (30)
Total net area of external elements Aum(A, m2)			365.0000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	81.7838		(33)
Main dwelling							
Party Wall			72.7000	0.0000	0.0000	0.0000	0.0000 (32)
Internal Wall			216.2000			9.0000	1945.8000 (32c)
Internal Ceiling			64.8000			9.0000	583.2000 (32e)
Internal Ceiling 2			34.1000			9.0000	306.9000 (32e)

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K (28)...(30) + (32) + (32a)...(32e) = 21680.5800 (34)
List of Thermal Bridges 111.7556 (35)

Element	Length	Psi-value	Total
K1 Element	16.2000	0.0400	0.6480
E2 Other lintels (including other steel lintels)	15.3000	0.0300	0.4590
E3 Sill	33.0000	0.0300	0.9900
E4 Jamb	28.1000	0.0600	1.6860
E5 Ground floor (normal)	42.9000	0.0700	3.0030
E6 Intermediate floor within a dwelling	15.4000	0.0900	1.3860
E16 Corner (normal)	15.4000	0.0600	0.9240
E18 Party wall between dwellings	6.2000	0.0800	0.4960
R1 Head of roof window	6.2000	0.0600	0.3720
R2 Sill of roof window	11.2000	0.0800	0.8960
R3 Jamb of roof window			

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 10.8600 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 92.6438 (37)

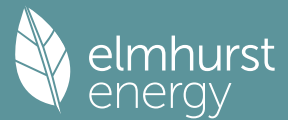
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	93.0028	92.5232	92.0530	89.8447	89.4315	87.5081	87.5081	87.1519	88.2489	89.4315	90.2673	91.1412
Heat transfer coeff	185.6467	185.1670	184.6968	182.4885	182.0753	180.1519	180.1519	179.7957	180.8928	182.0753	182.9112	183.7850
Average = Sum(39)m / 12 =												182.4865

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9569	0.9545	0.9520	0.9407	0.9385	0.9286	0.9286	0.9268	0.9324	0.9385	0.9428	0.9473
HLP (average)												0.9407
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.9941 (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													
	85.8552	84.5801	82.7846	79.4739	76.9949	74.2460	72.7612	74.5442	76.4856	79.4270	82.8058	85.5650	(42b)
Hot water usage for other uses													
	45.2927	43.6457	41.9987	40.3516	38.7046	37.0576	37.0576	38.7046	40.3516	41.9987	43.6457	45.2927	(42c)
Average daily hot water use (litres/day)													120.7765 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	131.1479	128.2258	124.7832	119.8255	115.6995	111.3037	109.8189	113.2489	116.8373	121.4256	126.4515	130.8576	(44)
Energy conte	207.7062	182.5918	191.7872	164.0351	155.7538	136.8608	132.8164	140.2258	144.0720	164.7734	180.1533	204.8914	(45)
Energy content (annual)										Total = Sum(45)m =			2005.6673
Distribution loss (46)m = 0.15 x (45)m													
	31.1559	27.3888	28.7681	24.6053	23.3631	20.5291	19.9225	21.0339	21.6108	24.7160	27.0230	30.7337	(46)
Water storage loss:													
Store volume													300.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.5900 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.8586 (55)
Total storage loss													
	26.6166	24.0408	26.6166	25.7580	26.6166	25.7580	26.6166	26.6166	25.7580	26.6166	25.7580	26.6166	(56)
If cylinder contains dedicated solar storage													
	26.6166	24.0408	26.6166	25.7580	26.6166	25.7580	26.6166	26.6166	25.7580	26.6166	25.7580	26.6166	(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)

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Total heat required for water heating calculated for each month												
	257.5852	227.6438	241.6662	212.3051	205.6328	185.1308	182.6954	190.1048	192.3420	214.6524	228.4233	254.7704 (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	257.5852	227.6438	241.6662	212.3051	205.6328	185.1308	182.6954	190.1048	192.3420	214.6524	228.4233	254.7704 (64)
Total per year (kWh/year) = Sum(64)m =												2592.9523 (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	108.9655	96.7534	103.6724	93.1577	91.6913	84.1222	84.0647	86.5283	86.5199	94.6904	98.5170	108.0296 (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	179.6465	179.6465	179.6465	179.6465	179.6465	179.6465	179.6465	179.6465	179.6465	179.6465	179.6465	179.6465 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	54.2045	48.1440	39.1533	29.6416	22.1574	18.7062	20.2127	26.2733	35.2639	44.7757	52.2598	55.7110 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	545.2340	550.8918	536.6343	506.2817	467.9670	431.9566	407.8994	402.2416	416.4991	446.8517	485.1664	521.1768 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.9588	55.9588	55.9588	55.9588	55.9588	55.9588	55.9588	55.9588	55.9588	55.9588	55.9588	55.9588 (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)	-119.7643	-119.7643	-119.7643	-119.7643	-119.7643	-119.7643	-119.7643	-119.7643	-119.7643	-119.7643	-119.7643	-119.7643 (71)
Water heating gains (Table 5)	146.4590	143.9782	139.3447	129.3857	123.2410	116.8364	112.9901	116.3014	120.1666	127.2720	136.8291	145.2011 (72)
Total internal gains	864.7384	861.8550	833.9732	784.1499	732.2064	683.3402	656.9432	660.6572	687.7706	737.7403	793.0963	840.9299 (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	
Northeast					10.6800	11.2829	0.7600	0.7000	0.7700		44.4261 (75)	
Southeast					2.6400	36.7938	0.7600	0.7000	0.7700		35.8116 (77)	
Southwest					6.8700	36.7938	0.7600	0.7000	0.7700		93.1916 (79)	
Northeast					2.1600	17.4137	0.7600	0.7000	1.0000		18.0094 (82)	
Southwest					0.7200	38.2331	0.7600	0.7000	1.0000		13.1803 (82)	
Horizontal					6.0000	26.0000	0.7600	0.7000	1.0000		74.6928 (82)	
Solar gains	279.3118	527.6506	848.3491	1244.3691	1556.6759	1613.4625	1527.4988	1286.4834	985.4804	618.3474	344.2754	232.5908 (83)
Total gains	1144.0503	1389.5056	1682.3223	2028.5190	2288.8823	2296.8027	2184.4420	1947.1407	1673.2510	1356.0877	1137.3717	1073.5206 (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	32.4400	32.5241	32.6069	33.0014	33.0763	33.4295	33.4295	33.4957	33.2926	33.0763	32.9252	32.7686
alpha	3.1627	3.1683	3.1738	3.2001	3.2051	3.2286	3.2286	3.2330	3.2195	3.2051	3.1950	3.1846
util living area	0.9726	0.9504	0.9007	0.7932	0.6378	0.4734	0.3540	0.4090	0.6420	0.8709	0.9562	0.9772 (86)
MIT	19.3418	19.5977	19.9884	20.4307	20.7196	20.8527	20.8894	20.8805	20.7667	20.3409	19.7556	19.2971 (87)
Th 2	20.1194	20.1214	20.1235	20.1331	20.1349	20.1432	20.1432	20.1448	20.1400	20.1349	20.1312	20.1274 (88)
util rest of house	0.9684	0.9431	0.8865	0.7659	0.5954	0.4176	0.2883	0.3384	0.5841	0.8465	0.9485	0.9736 (89)
MIT 2	18.1516	18.4758	18.9646	19.5068	19.8364	19.9808	20.0123	20.0081	19.9004	19.4153	18.6865	18.1007 (90)
Living area fraction	18.6087	18.9067	19.3578	19.8616	20.1755	20.3156	20.3491	20.3431	20.2331	19.7708	19.0970	18.5601 (92)
MIT	18.6087	18.9067	19.3578	19.8616	20.1755	20.3156	20.3491	20.3431	20.2331	19.7708	19.0970	18.5601 (92)
Temperature adjustment	18.4587	18.7567	19.2078	19.7116	20.0255	20.1656	20.1991	20.1931	20.0831	19.6208	18.9470	-0.1500
adjusted MIT	18.4587	18.7567	19.2078	19.7116	20.0255	20.1656	20.1991	20.1931	20.0831	19.6208	18.9470	18.4101 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9580	0.9288	0.8689	0.7512	0.5897	0.4191	0.2927	0.3425	0.5800	0.8294	0.9351	0.9644 (94)
Useful gains	1096.0132	1290.5783	1461.7879	1523.8881	1349.8653	962.5681	639.3016	666.8991	970.5036	1124.7998	1063.5191	1035.3281 (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	2628.5066	2565.7958	2347.0875	1972.9939	1515.8729	1002.6594	648.3869	681.9869	1082.2930	1642.4563	2166.9508	2611.6081 (97)
Space heating kWh	1140.1751	856.9462	658.6629	323.3562	123.5096	0.0000	0.0000	0.0000	0.0000	385.1364	794.4709	1172.7523 (98a)
Space heating requirement - total per year (kWh/year)												5455.0097
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	1140.1751	856.9462	658.6629	323.3562	123.5096	0.0000	0.0000	0.0000	0.0000	385.1364	794.4709	1172.7523 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												5455.0097
Space heating per m ²												(98c) / (4) = 28.1186 (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 %)	88.8000 (206)

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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	1140.1751	856.9462	658.6629	323.3562	123.5096	0.0000	0.0000	0.0000	0.0000	385.1364	794.4709	1172.7523 (98)
Space heating efficiency (main heating system 1)	88.8000	88.8000	88.8000	88.8000	88.8000	0.0000	0.0000	0.0000	0.0000	88.8000	88.8000	88.8000 (210)
Space heating fuel (main heating system)	1283.9809	965.0295	741.7375	364.1399	139.0874	0.0000	0.0000	0.0000	0.0000	433.7122	894.6744	1320.6670 (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	257.5852	227.6438	241.6662	212.3051	205.6328	185.1308	182.6954	190.1048	192.3420	214.6524	228.4233	254.7704 (64)
Efficiency of water heater (217)m	86.9920	86.7466	86.1908	85.0005	82.9549	79.8000	79.8000	79.8000	79.8000	85.3549	86.6185	79.8000 (216)
Fuel for water heating, kWh/month	296.1023	262.4240	280.3853	249.7694	247.8849	231.9935	228.9416	238.2265	241.0301	251.4823	263.7120	87.0479 (217)
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	47.4449	38.0620	34.2707	25.1082	19.3943	15.8453	17.6921	22.9968	29.8706	39.1919	44.2671	48.7635 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-94.3924	-127.5184	-175.0190	-184.9398	-188.1247	-171.2128	-168.8209	-164.7581	-155.4165	-140.5036	-101.4758	-82.0062 (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	-79.7294	-170.9790	-351.0062	-540.0534	-720.7851	-726.7873	-715.5299	-599.8731	-430.0571	-246.2187	-106.7051	-62.5474 (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												6143.0289 (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												3084.6305 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
central heating pump												41.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												86.0000 (231)
Electricity for lighting (calculated in Appendix L)												382.9074 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-6504.4600 (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												3192.1067 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	6143.0289	3.6400	223.6063	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3084.6305	3.6400	112.2805	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	86.0000	16.4900	14.1814	(249)
Energy for lighting	382.9074	16.4900	63.1414	(250)
Additional standing charges			92.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1754.1883	16.4900	-289.2656	
PV Unit electricity exported	-4750.2717	5.5900	-265.5402	
Total			-554.8058	(252)
Total energy cost			-49.5962	(255)

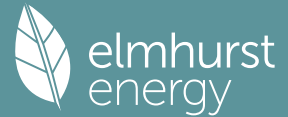
11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	-0.0747 (257)
SAP value		101.2110
SAP rating (Section 12)		101 (258)
SAP band		A

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	6143.0289	0.2100	1290.0361	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3084.6305	0.2100	647.7724	(264)
Space and water heating			1937.8085	(265)

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Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	382.9074	0.1443	55.2654 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1754.1883	0.1359	-238.3424
PV Unit electricity exported	-4750.2717	0.1253	-595.4444
Total			-833.7868 (269)
Total CO ₂ , kg/year			1171.2163 (272)
CO ₂ emissions per m ²			6.0400 (273)
EI value			93.4333
EI rating			93 (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

Main dwelling	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	95.1000 (1b)	x 2.4000 (2b)	= 228.2400 (1b) - (3b)
First floor	64.8000 (1c)	x 2.6000 (2c)	= 168.4800 (1c) - (3c)
Second floor	34.1000 (1d)	x 2.7000 (2d)	= 92.0700 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	194.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	488.7900 (5)

2. Ventilation rate

Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	4 * 10 =	40.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.0818 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.3318	(18)
Number of sides sheltered	1	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3069 (21)

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	4.6000	4.4000	4.4000	4.1000	4.1000	3.7000	3.7000	3.5000	3.8000	4.2000	4.0000	4.3000 (22)
Adj infilt rate	1.1500	1.1000	1.1000	1.0250	1.0250	0.9250	0.9250	0.8750	0.9500	1.0500	1.0000	1.0750 (22a)
Effective ac	0.3530	0.3376	0.3376	0.3146	0.3146	0.2839	0.2839	0.2686	0.2916	0.3223	0.3069	0.3300 (22b)
	0.5623	0.5570	0.5570	0.5495	0.5495	0.5403	0.5403	0.5361	0.5425	0.5519	0.5471	0.5544 (25)

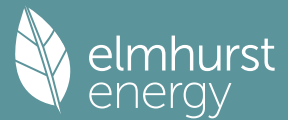
3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Windows			20.1900	1.1450	23.1183		(27)
Roof Windows			8.8800	1.1450	10.1679		(27a)
Door			1.8900	1.2000	2.2680		(26)
Heat Loss Floor			95.1000	0.1100	10.4610	110.0000	10461.0000 (28a)
Cavity Wall	144.3000	22.0800	122.2200	0.1800	21.9996	60.0000	7333.2000 (29a)
Stud Wall	28.1000		28.1000	0.1100	3.0910	9.0000	252.9000 (29a)
Flat Roof	23.5000	6.0000	17.5000	0.1400	2.4500	9.0000	157.5000 (30)
Plane Roof	60.6000		60.6000	0.1132	6.8604	9.0000	545.4000 (30)
Slope Roof	13.4000	2.8800	10.5200	0.1300	1.3676	9.0000	94.6800 (30)
Total net area of external elements Aum(A, m ²)			365.0000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	81.7838		(33)
Main dwelling							
Party Wall			72.7000	0.0000	0.0000	0.0000	0.0000 (32)
Internal Wall			216.2000			9.0000	1945.8000 (32c)
Internal Ceiling			64.8000			9.0000	583.2000 (32e)
Internal Ceiling 2			34.1000			9.0000	306.9000 (32e)

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K
(28)...(30) + (32) + (32a)...(32e) = 21680.5800 (34)
111.7556 (35)

List of Thermal Bridges	Length	Psi-value	Total
K1 Element	16.2000	0.0400	0.6480
E2 Other lintels (including other steel lintels)	15.3000	0.0300	0.4590
E3 Sill	33.0000	0.0300	0.9900
E4 Jamb	28.1000	0.0600	1.6860
E5 Ground floor (normal)	42.9000	0.0700	3.0030
E6 Intermediate floor within a dwelling	15.4000	0.0900	1.3860
E16 Corner (normal)	15.4000	0.0600	0.9240
E18 Party wall between dwellings	6.2000	0.0800	0.4960
R1 Head of roof window			

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R2 Sill of roof window					6.2000					0.0600					0.3720
R3 Jamb of roof window					11.2000					0.0800					0.8960
Thermal bridges (Sum(L x Psi) calculated using Appendix K)															
Point Thermal bridges															
Total fabric heat loss															
(33) + (36) + (36a) =															
10.8600 (36)															
0.0000															
92.6438 (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	90.6995	89.8447	89.8447	88.6336	88.6336	87.1519	87.1519	86.4680	87.5081	89.0278	88.2489	89.4315	(38)		
Average = Sum(39)m / 12 =	183.3433	182.4885	182.4885	181.2775	181.2775	179.7957	179.7957	179.1119	180.1519	181.6716	180.8928	182.0753	(39)		
												181.1975			
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
HLP (average)	0.9451	0.9407	0.9407	0.9344	0.9344	0.9268	0.9268	0.9233	0.9286	0.9365	0.9324	0.9385	(40)		
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31			
												0.9340			
												31			

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.9941 (42)
Hot water usage for mixer showers													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths													
85.8552	84.5801	82.7846	79.4739	76.9949	74.2460	72.7612	74.5442	76.4856	79.4270	82.8058	85.5650	85.5650	(42b)
Hot water usage for other uses													
45.2927	43.6457	41.9987	40.3516	38.7046	37.0576	37.0576	38.7046	40.3516	41.9987	43.6457	45.2927	45.2927	(42c)
Average daily hot water use (litres/day)												120.7765	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
131.1479	128.2258	124.7832	119.8255	115.6995	111.3037	109.8189	113.2489	116.8373	121.4256	126.4515	130.8576	130.8576	(44)
Energy conte	207.7062	182.5918	191.7872	164.0351	155.7538	136.8608	132.8164	140.2258	144.0720	164.7734	180.1533	204.8914	(45)
Energy content (annual)												2005.6673	
Distribution loss (46)m = 0.15 x (45)m													
31.1559	27.3888	28.7681	24.6053	23.3631	20.5291	19.9225	21.0339	21.6108	24.7160	27.0230	30.7337	30.7337	(46)
Water storage loss:													
Store volume												300.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5900	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8586	(55)
Total storage loss													
26.6166	24.0408	26.6166	25.7580	26.6166	25.7580	26.6166	26.6166	25.7580	26.6166	25.7580	26.6166	26.6166	(56)
If cylinder contains dedicated solar storage													
26.6166	24.0408	26.6166	25.7580	26.6166	25.7580	26.6166	26.6166	25.7580	26.6166	25.7580	26.6166	26.6166	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	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	(61)
Total heat required for water heating calculated for each month													
257.5852	227.6438	241.6662	212.3051	205.6328	185.1308	182.6954	190.1048	192.3420	214.6524	228.4233	254.7704	254.7704	(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	257.5852	227.6438	241.6662	212.3051	205.6328	185.1308	182.6954	190.1048	192.3420	214.6524	228.4233	254.7704	(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													
108.9655	96.7534	103.6724	93.1577	91.6913	84.1222	84.0647	86.5283	86.5199	94.6904	98.5170	108.0296	108.0296	(65)

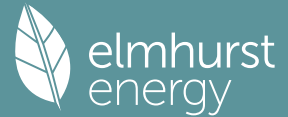
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	179.6465	179.6465	179.6465	179.6465	179.6465	179.6465	179.6465	179.6465	179.6465	179.6465	179.6465	179.6465	(66)
54.2045	48.1440	39.1533	29.6416	22.1574	18.7062	20.2127	26.2733	35.2639	44.7757	52.2598	55.7110	55.7110	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
545.2340	550.8918	536.6343	506.2817	467.9670	431.9566	407.8994	402.2416	416.4991	446.8517	485.1664	521.1768	521.1768	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
55.9588	55.9588	55.9588	55.9588	55.9588	55.9588	55.9588	55.9588	55.9588	55.9588	55.9588	55.9588	55.9588	(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	(70)
Losses e.g. evaporation (negative values) (Table 5)													
-119.7643	-119.7643	-119.7643	-119.7643	-119.7643	-119.7643	-119.7643	-119.7643	-119.7643	-119.7643	-119.7643	-119.7643	-119.7643	(71)
Water heating gains (Table 5)													
146.4590	143.9782	139.3447	129.3857	123.2410	116.8364	112.9901	116.3014	120.1666	127.2720	136.8291	145.2011	145.2011	(72)
Total internal gains	864.7384	861.8550	833.9732	784.1499	732.2064	683.3402	656.9432	660.6572	687.7706	737.7403	793.0963	840.9299	(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
Northeast				10.6800	13.7804		0.7600		0.7000		0.7700		54.2598 (75)
Southeast				2.6400	43.0593		0.7600		0.7000		0.7700		41.9098 (77)
Southwest				6.8700	43.0593		0.7600		0.7000		0.7700		109.0607 (79)
Northeast				2.1600	21.4042		0.7600		0.7000		1.0000		22.1364 (82)
Southwest				0.7200	45.8318		0.7600		0.7000		1.0000		15.7999 (82)
Horizontal				6.0000	32.0000		0.7600		0.7000		1.0000		91.9296 (82)
Solar gains	335.0962	554.8633	880.1474	1326.5458	1609.0552	1764.3748	1653.6662	1427.0465	1093.4612	689.7421	397.0693		280.4074 (83)
Total gains	1199.8347	1416.7183	1714.1206	2110.6956	2341.2616	2447.7150	2310.6094	2087.7038	1781.2318	1427.4824	1190.1656		1121.3372 (84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)	
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	32.8476	33.0014	33.0014	33.2219	33.2219	33.4957	33.4957	33.6236	33.4295	33.1498	33.2926	33.0763	
alpha	3.1898	3.2001	3.2001	3.2148	3.2148	3.2330	3.2330	3.2416	3.2286	3.2100	3.2195	3.2051	
util living area	0.9667	0.9440	0.8871	0.7580	0.5925	0.3973	0.2842	0.3202	0.5806	0.8420	0.9458	0.9720 (86)	
MIT	19.4616	19.6974	20.0871	20.5206	20.7683	20.8776	20.8981	20.8954	20.8106	20.4323	19.8761	19.4199 (87)	
Th 2	20.1294	20.1331	20.1331	20.1383	20.1383	20.1448	20.1448	20.1478	20.1432	20.1366	20.1400	20.1349 (88)	
util rest of house	0.9616	0.9357	0.8710	0.7272	0.5468	0.3409	0.2200	0.2507	0.5190	0.8128	0.9362	0.9677 (89)	
MIT 2	18.3106	18.6100	19.0940	19.6159	19.8912	20.0038	20.0196	20.0213	19.9455	19.5250	18.8444	18.2621 (90)	
Living area fraction	18.7526	19.0276	19.4754	19.9634	20.2280	20.3393	20.3570	20.3570	fLA = Living area / (4) =				0.3840 (91)
MIT	18.7526	19.0276	19.4754	19.9634	20.2280	20.3393	20.3570	20.3570	20.2777	19.8735	19.2406	18.7067 (92)	
Temperature adjustment												-0.1500	
adjusted MIT	18.6026	18.8776	19.3254	19.8134	20.0780	20.1893	20.2070	20.2070	20.1277	19.7235	19.0906	18.5567 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9500	0.9209	0.8535	0.7146	0.5435	0.3439	0.2248	0.2556	0.5178	0.7966	0.9215	0.9573 (94)
Useful gains	1139.8762	1304.5992	1462.9275	1508.3075	1272.4654	841.8218	519.3478	533.6272	922.3737	1137.1892	1096.7906	1073.4411 (95)
Ext temp.	4.7000	5.3000	7.0000	9.5000	12.4000	15.4000	17.3000	17.2000	14.6000	11.1000	7.6000	4.7000 (96)
Heat loss rate W	2548.9534	2477.7507	2249.2380	1869.5783	1391.8516	861.1042	522.6645	538.5895	995.8335	1566.6372	2078.5694	2522.9604 (97)
Space heating kWh	1048.3534	788.3578	585.0151	260.1149	88.8233	0.0000	0.0000	0.0000	0.0000	319.5093	706.8808	1078.4423 (98a)
Space heating requirement - total per year (kWh/year)												4875.4969
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)												0.0000
Space heating kWh	1048.3534	788.3578	585.0151	260.1149	88.8233	0.0000	0.0000	0.0000	0.0000	319.5093	706.8808	1078.4423 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4875.4969
Space heating per m2										(98c) / (4) =		25.1314 (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 %)												88.8000 (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	1048.3534	788.3578	585.0151	260.1149	88.8233	0.0000	0.0000	0.0000	0.0000	319.5093	706.8808	1078.4423 (98)
Space heating efficiency (main heating system 1)	88.8000	88.8000	88.8000	88.8000	88.8000	0.0000	0.0000	0.0000	0.0000	88.8000	88.8000	88.8000 (210)
Space heating fuel (main heating system)	1180.5781	887.7903	658.8007	292.9222	100.0263	0.0000	0.0000	0.0000	0.0000	359.8078	796.0369	1214.4621 (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	257.5852	227.6438	241.6662	212.3051	205.6328	185.1308	182.6954	190.1048	192.3420	214.6524	228.4233	254.7704 (64)
Efficiency of water heater	86.8676	86.6114	85.9657	84.5164	82.3167	79.8000	79.8000	79.8000	79.8000	84.9500	86.4197	79.8000 (216)
Fuel for water heating, kWh/month	296.5262	262.8337	281.1192	251.2000	249.8070	231.9935	228.9416	238.2265	241.0301	252.6810	264.3187	293.0870 (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	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	47.4449	38.0620	34.2707	25.1082	19.3943	15.8453	17.6921	22.9968	29.8706	39.1919	44.2671	48.7635 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-106.8259	-131.1324	-177.5319	-188.0654	-189.0562	-173.1318	-170.5146	-167.9128	-160.1709	-147.7596	-110.9400	-93.5754 (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)	-102.5042	-182.6448	-366.1039	-579.8240	-743.8249	-802.1384	-780.2109	-674.4367	-486.1314	-282.8780	-129.5007	-81.1667 (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												5490.4244 (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												3091.7646 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
central heating pump												41.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												86.0000 (231)
Electricity for lighting (calculated in Appendix L)												382.9074 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-7027.9815 (233)
Wind generation												0.0000 (234)

Full SAP Calculation Printout



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	2023.1150 (238)

10a. Fuel costs - using BEDF prices (567)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	5490.4244	5.6000	307.4638 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3091.7646	5.6000	173.1388 (247)
Energy for instantaneous electric shower(s)	0.0000	26.0600	0.0000 (247a)
Pumps, fans and electric keep-hot	86.0000	26.0600	22.4116 (249)
Energy for lighting	382.9074	26.0600	99.7857 (250)
Additional standing charges			99.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1816.6169	26.0600	-473.4104
PV Unit electricity exported	-5211.3646	5.8100	-302.7803
Total			-776.1907 (252)
Total energy cost			-74.3908 (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	5490.4244	0.2100	1152.9891 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3091.7646	0.2100	649.2706 (264)
Space and water heating			1802.2597 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	382.9074	0.1443	55.2654 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1816.6169	0.1363	-247.5550
PV Unit electricity exported	-5211.3646	0.1254	-653.4438
Total			-900.9988 (269)
Total CO2, kg/year			968.4556 (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	5490.4244	1.1300	6204.1796 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3091.7646	1.1300	3493.6940 (278)
Space and water heating			9697.8736 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	382.9074	1.5338	587.3162 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1816.6169	1.5037	-2731.6925
PV Unit electricity exported	-5211.3646	0.4602	-2398.1079
Total			-5129.8004 (283)
Total Primary energy kWh/year			5285.4902 (286)