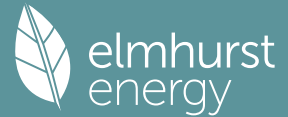


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Property Reference	UNIT 38				Issued on Date	02/07/2025	
Assessment Reference	UNIT 38			Prop Type Ref			
Property	Flat 39, Alexander House, 205 Kings Road, READING, RG1 4FW						
SAP Rating	87 B	DER	3.44	TER	9.31		
Environmental	97 A	% DER < TER				63.05	
CO ₂ Emissions (t/year)	0.22	DFEE	33.50	TFEE	38.14		
Compliance Check	See BREL	% DFEE < TFEE				12.16	
% DPER < TPER	27.03	DPER	36.30	TPER	49.74		
Assessor Details	Mr. Ondrej Gajdos				Assessor ID	W452-0001	
Client							

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling	68.6000 (1b)	2.5000 (2b)	171.5000 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	68.6000		
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 171.5000 (5)

2. Ventilation rate

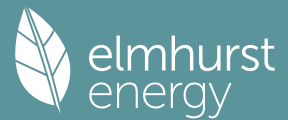
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.5900 (17)
Infiltration rate	0.1795 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1526 (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	0.1945	0.1907	0.1869	0.1678	0.1640	0.1449	0.1449	0.1411	0.1526	0.1640	0.1716	0.1793 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												79.2000 (23c)
Effective ac	0.2985	0.2947	0.2909	0.2718	0.2680	0.2489	0.2489	0.2451	0.2566	0.2680	0.2756	0.2833 (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							
1			6.5000	1.1450	7.4427		(27)
2			3.3800	1.1450	3.8702		(27)
3			6.5000	1.1450	7.4427		(27)
1			2.1000	1.0000	2.1000		(26)
top floor exposed new	42.2500	16.3800	25.8700	0.2000	5.1740	18.0000	465.6600 (29a)
corridor new	18.2500	2.1000	16.1500	0.2300	3.7145	14.0000	226.1000 (29a)
flat roof new	31.6000		31.6000	0.1300	4.1080	9.0000	284.4000 (30)
roof terrace new	37.0000		37.0000	0.1300	4.8100	9.0000	333.0000 (30)
Total net area of external elements Aum (A, m ²)			129.1000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	38.6622		(33)
Main dwelling							
pw			27.2500	0.0000	0.0000	20.0000	545.0000 (32)
pf			66.4000			30.0000	1992.0000 (32d)
iw			87.5000			9.0000	787.5000 (32c)

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Heat capacity $C_m = \text{Sum}(A \times k)$
Thermal mass parameter (TMP = C_m / TFA) in $\text{kJ/m}^2\text{K}$ (28)...(30) + (32) + (32a)...(32e) = 4633.6600 (34)
List of Thermal Bridges 67.5461 (35)

	Length	Psi-value	Total
K1 Element	7.5500	0.0470	0.3548
E2 Other lintels (including other steel lintels)	6.5500	0.0150	0.0982
E3 Sill	19.2000	0.0470	0.9024
E4 Jamb	0.0000	0.0700	0.0000
E7 Party floor between dwellings (in blocks of flats)	0.0000	0.0800	0.0000
E14 Flat roof	17.0000	0.1970	3.3490
E15 Flat roof with parapet	2.5000	0.1800	0.4500
E16 Corner (normal)	5.0000	0.2400	1.2000
E18 Party wall between dwellings	17.0000	0.0500	0.8500
E24 Eaves (insulation at ceiling level - inverted)			7.2045 (36)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			0.0000
Point Thermal Bridges			(36a) =
Total fabric heat loss			(33) + (36) + (36a) = 45.8667 (37)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ventilation heat loss calculated monthly (38)m = $0.33 \times (25)\text{m} \times (5)$													
(38)m	16.8955	16.6796	16.4637	15.3844	15.1685	14.0891	14.0891	13.8732	14.5209	15.1685	15.6002	16.0320	(38)
Heat transfer coeff	62.7622	62.5463	62.3305	61.2511	61.0352	59.9558	59.9558	59.7400	60.3876	61.0352	61.4670	61.8987	(39)
Average = $\text{Sum}(39)\text{m} / 12 =$												61.1971	
HLP	0.9149	0.9118	0.9086	0.8929	0.8897	0.8740	0.8740	0.8708	0.8803	0.8897	0.8960	0.9023	(40)
HLP (average)												0.8921	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.2117 (42)
Hot water usage for mixer showers	61.3019	60.3807	59.0382	56.4697	54.5742	52.4604	51.2589	52.5911	54.0516	56.3212	58.9449	61.0671	(42a)
Hot water usage for baths	26.4851	26.0917	25.5378	24.5165	23.7518	22.9038	22.4458	22.9958	23.5947	24.5020	25.5444	26.3955	(42b)
Hot water usage for other uses	37.2796	35.9240	34.5684	33.2128	31.8571	30.5015	30.5015	31.8571	33.2128	34.5684	35.9240	37.2796	(42c)
Average daily hot water use (litres/day)												114.9647	(43)
Daily hot water use	125.0666	122.3964	119.1444	114.1990	110.1831	105.8657	104.2061	107.4441	110.8590	115.3916	120.4133	124.7422	(44)
Energy conte	198.0749	174.2908	183.1206	156.3327	148.3277	130.1742	126.0283	133.0382	136.7002	156.5853	171.5508	195.3161	(45)
Energy content (annual)										Total =	Sum(45)m =	1909.5399	
Distribution loss (46)m = $0.15 \times (45)\text{m}$	29.7112	26.1436	27.4681	23.4499	22.2491	19.5261	18.9042	19.9557	20.5050	23.4878	25.7326	29.2974	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5500	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8370	(55)
Total storage loss	25.9470	23.4360	25.9470	25.1100	25.9470	25.1100	25.9470	25.9470	25.1100	25.9470	25.1100	25.9470	(56)
If cylinder contains dedicated solar storage	25.9470	23.4360	25.9470	25.1100	25.9470	25.1100	25.9470	25.9470	25.1100	25.9470	25.1100	25.9470	(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	247.2843	218.7380	232.3300	203.9547	197.5371	177.7962	175.2377	182.2476	184.3222	205.7947	219.1728	244.5255	(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	247.2843	218.7380	232.3300	203.9547	197.5371	177.7962	175.2377	182.2476	184.3222	205.7947	219.1728	244.5255	(64)
12Total per year (kWh/year)										Total per year (kWh/year) =	Sum(64)m =	2488.9409	(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	105.2274	93.5095	100.2551	90.0782	88.6865	81.3805	81.2719	83.6027	83.5504	91.4321	95.1382	104.3101	(65)

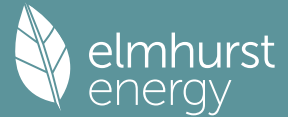
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
(66)m	110.5831	110.5831	110.5831	110.5831	110.5831	110.5831	110.5831	110.5831	110.5831	110.5831	110.5831	110.5831	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	97.8546	108.3390	97.8546	101.1164	97.8546	101.1164	97.8546	97.8546	101.1164	97.8546	101.1164	97.8546	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	194.0077	196.0209	190.9477	180.1475	166.5142	153.7008	145.1407	143.1275	148.2007	159.0009	172.6342	185.4476	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.0583	34.0583	34.0583	34.0583	34.0583	34.0583	34.0583	34.0583	34.0583	34.0583	34.0583	34.0583	(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)	-88.4665	-88.4665	-88.4665	-88.4665	-88.4665	-88.4665	-88.4665	-88.4665	-88.4665	-88.4665	-88.4665	-88.4665	(71)
Water heating gains (Table 5)	141.4347	139.1510	134.7515	125.1086	119.2022	113.0285	109.2365	112.3693	116.0423	122.8927	132.1364	140.2018	(72)
Total internal gains	489.4720	499.6859	479.7288	462.5475	439.7460	424.0207	408.4067	409.5263	421.5343	435.9231	462.0620	479.6789	(73)

6. Solar gains

[Jan]	Area m ²	Solar flux Table 6a W/m ²	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
South	6.5000	46.7521	0.6300	0.8000	0.7700	106.1397 (78)
West	3.3800	19.6403	0.6300	0.8000	0.7700	23.1861 (80)

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South				6.5000		46.7521		0.6300		0.8000		0.7700		106.1397 (78)	
Solar gains	235.4655	393.0160	517.5523	609.4636	655.0867	638.6178	620.5489	588.0459	549.4903	428.8027	280.5339	202.4961	(83)		
Total gains	724.9375	892.7018	997.2811	1072.0111	1094.8327	1062.6385	1028.9556	997.5722	971.0246	864.7258	742.5959	682.1750	(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	20.5080	20.5788	20.6501	21.0140	21.0883	21.4679	21.4679	21.5455	21.3144	21.0883	20.9402	20.7941	
alpha	2.3672	2.3719	2.3767	2.4009	2.4059	2.4312	2.4312	2.4364	2.4210	2.4059	2.3960	2.3863	
util living area	0.8188	0.7445	0.6685	0.5683	0.4609	0.3411	0.2493	0.2667	0.3957	0.5916	0.7532	0.8345	(86)
Living	19.1320	19.5909	20.0226	20.4522	20.7379	20.9109	20.9697	20.9634	20.8643	20.4874	19.7763	19.0542	
Non living	17.9825	18.5428	19.0667	19.5865	19.9161	20.1136	20.1692	20.1667	20.0635	19.6413	18.7911	17.8943	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.0444	19.5909	20.0226	20.4522	20.7379	20.9109	20.9697	20.9634	20.8643	20.4874	19.7763	19.3264	(87)
Th 2	20.1549	20.1575	20.1602	20.1736	20.1762	20.1897	20.1897	20.1924	20.1843	20.1762	20.1709	20.1655	(88)
util rest of house	0.8044	0.7265	0.6465	0.5414	0.4280	0.3021	0.2055	0.2223	0.3552	0.5600	0.7328	0.8211	(89)
MIT 2	19.2888	18.5428	19.0667	19.5865	19.9161	20.1136	20.1692	20.1667	20.0635	19.6413	18.7911	18.3035	(90)
Living area fraction													
MIT	19.7096	19.1264	19.5990	20.0686	20.3737	20.5576	20.6149	20.6104	20.5094	20.1124	19.3397	18.8731	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7096	19.1264	19.5990	20.0686	20.3737	20.5576	20.6149	20.6104	20.5094	20.1124	19.3397	18.8731	(93)

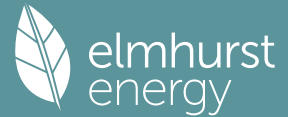
8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.7962	0.7023	0.6308	0.5378	0.4361	0.3200	0.2287	0.2455	0.3716	0.5575	0.7101	0.7974	(94)
Useful gains	577.2152	626.9366	629.0941	576.5593	477.4260	340.0413	235.2863	244.9138	360.8109	482.0609	527.3329	543.9869	(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	967.1375	889.8107	816.4671	684.0873	529.4020	357.1920	240.7180	251.5270	387.0487	580.5930	752.3388	908.2461	(97)
Space heating kWh	290.1022	176.6513	139.4055	77.4201	38.6701	0.0000	0.0000	0.0000	0.0000	73.3079	162.0043	271.0088	(98a)
Space heating requirement - total per year (kWh/year)												1228.5703	
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	290.1022	176.6513	139.4055	77.4201	38.6701	0.0000	0.0000	0.0000	0.0000	73.3079	162.0043	271.0088	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1228.5703	
Space heating per m2												17.9092	(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 %)													224.8044 (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	290.1022	176.6513	139.4055	77.4201	38.6701	0.0000	0.0000	0.0000	0.0000	73.3079	162.0043	271.0088	(98)
Space heating efficiency (main heating system 1)	224.8044	224.8044	224.8044	224.8044	224.8044	0.0000	0.0000	0.0000	0.0000	224.8044	224.8044	224.8044	(210)
Space heating fuel (main heating system)	129.0465	78.5800	62.0119	34.4389	17.2017	0.0000	0.0000	0.0000	0.0000	32.6096	72.0645	120.5531	(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	247.2843	218.7380	232.3300	203.9547	197.5371	177.7962	175.2377	182.2476	184.3222	205.7947	219.1728	244.5255	(64)
Efficiency of water heater (217)m	322.9383	322.9383	322.9383	322.9383	322.9383	322.9383	322.9383	322.9383	322.9383	322.9383	322.9383	322.9383	(216)
Fuel for water heating, kWh/month	76.5732	67.7337	71.9425	63.1559	61.1687	55.0558	54.2635	56.4342	57.0766	63.7257	67.8683	75.7190	(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	11.9949	10.8341	11.9949	11.6080	11.9949	11.6080	11.9949	11.9949	11.6080	11.9949	11.6080	11.9949	(231)
Lighting	19.5473	15.6815	14.1195	10.3445	7.9904	6.5282	7.2891	9.4747	12.3067	16.1470	18.2380	20.0905	(232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity) (233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												546.5063	(211)
Space heating fuel - main system 2												0.0000	(213)

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Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	322.9383
Water heating fuel used	770.7171 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans: (BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.6750)	
mechanical ventilation fans (SFP = 0.6750)	141.2302 (230a)
Total electricity for the above, kWh/year	141.2302 (231)
Electricity for lighting (calculated in Appendix L)	157.7577 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	0.0000 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	1616.2113 (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	546.5063	0.1560	85.2574 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	770.7171	0.1409	108.6025 (264)
Space and water heating			193.8599 (265)
Pumps, fans and electric keep-hot	141.2302	0.1387	19.5904 (267)
Energy for lighting	157.7577	0.1443	22.7693 (268)
Total CO2, kg/year			236.2196 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.4400 (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	546.5063	1.5775	862.1041 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	770.7171	1.5210	1172.2903 (278)
Space and water heating			2034.3945 (279)
Pumps, fans and electric keep-hot	141.2302	1.5128	213.6531 (281)
Energy for lighting	157.7577	1.5338	241.9740 (282)
Total Primary energy kWh/year			2490.0215 (286)
Dwelling Primary energy Rate (DPER)			36.3000 (287)

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

1. Overall dwelling characteristics

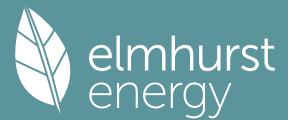
	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	68.6000 (1b)	x 2.5000 (2b)	= 171.5000 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	68.6000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 171.5000 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.1166 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3666 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3116 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infiltr rate	0.3973	0.3895	0.3817	0.3428	0.3350	0.2960	0.2960	0.2883	0.3116	0.3350	0.3506	0.3662 (22b)
Effective ac	0.5789	0.5759	0.5729	0.5588	0.5561	0.5438	0.5438	0.5415	0.5486	0.5561	0.5615	0.5670 (25)

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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			2.1000	1.0000	2.1000			(26)					
TER Opening Type			15.0500	1.1450	17.2328			(27)					
top floor exposed new	42.2500	15.0500	27.2000	0.1800	4.8960			(29a)					
corridor new	18.2500	2.1000	16.1500	0.1800	2.9070			(29a)					
flat roof new	31.6000		31.6000	0.1100	3.4760			(30)					
roof terrace new	37.0000		37.0000	0.1100	4.0700			(30)					
Total net area of external elements Aum(A, m2)			129.1000					(31)					
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		34.6818			(33)					
Main dwelling													
pw			27.2500	0.0000	0.0000			(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							67.5461	(35)					
List of Thermal Bridges													
K1 Element				Length	Psi-value		Total						
E2 Other lintels (including other steel lintels)				7.5500	0.0500		0.3775						
E3 Sill				6.5500	0.0500		0.3275						
E4 Jamb				19.2000	0.0500		0.9600						
E7 Party floor between dwellings (in blocks of flats)				0.0000	0.0700		0.0000						
E14 Flat roof				0.0000	0.0800		0.0000						
E15 Flat roof with parapet				17.0000	0.5600		9.5200						
E16 Corner (normal)				2.5000	0.0900		0.2250						
E18 Party wall between dwellings				5.0000	0.0600		0.3000						
E24 Eaves (insulation at ceiling level - inverted)				17.0000	0.2400		4.0800						
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							15.7900	(36)					
Point Thermal bridges						(36a) =	0.0000						
Total fabric heat loss						(33) + (36) + (36a) =	50.4718	(37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 32.7647	Feb 32.5912	Mar 32.4212	Apr 31.6226	May 31.4731	Jun 30.7776	Jul 30.7776	Aug 30.6487	Sep 31.0455	Oct 31.4731	Nov 31.7754	Dec 32.0914	(38)
Heat transfer coeff	83.2365	83.0630	82.8930	82.0944	81.9450	81.2494	81.2494	81.1206	81.5173	81.9450	82.2472	82.5633	(39)
Average = Sum(39)m / 12 =												82.0937	
HLP	Jan 1.2134	Feb 1.2108	Mar 1.2084	Apr 1.1967	May 1.1945	Jun 1.1844	Jul 1.1844	Aug 1.1825	Sep 1.1883	Oct 1.1945	Nov 1.1989	Dec 1.2035	(40)
HLP (average)												1.1967	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.2117	(42)
Hot water usage for mixer showers														
61.3019	60.3807	59.0382	56.4697	54.5742	52.4604	51.2589	52.5911	54.0516	56.3212	58.9449	61.0671	61.0671	(42a)	
Hot water usage for baths														
26.4851	26.0917	25.5378	24.5165	23.7518	22.9038	22.4458	22.9958	23.5947	24.5020	25.5444	26.3955	26.3955	(42b)	
Hot water usage for other uses														
37.2796	35.9240	34.5684	33.2128	31.8571	30.5015	30.5015	31.8571	33.2128	34.5684	35.9240	37.2796	37.2796	(42c)	
Average daily hot water use (litres/day)													114.9647	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Daily hot water use														
125.0666	122.3964	119.1444	114.1990	110.1831	105.8657	104.2061	107.4441	110.8590	115.3916	120.4133	124.7422	124.7422	(44)	
Energy content (annual)	198.0749	174.2908	183.1206	156.3327	148.3277	130.1742	126.0283	133.0382	136.7002	156.5853	171.5508	195.3161	(45)	
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		1909.5399		
29.7112	26.1436	27.4681	23.4499	22.2491	19.5261	18.9042	19.9557	20.5050	23.4878	25.7326	29.2974	29.2974	(46)	
Water storage loss:														
Store volume													150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):													1.3938	(48)
Temperature factor from Table 2b													0.5400	(49)
Enter (49) or (54) in (55)													0.7527	(55)
Total storage loss														
23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	(56)	
If cylinder contains dedicated solar storage														
23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	(57)	
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)	
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)	
Total heat required for water heating calculated for each month														
244.6698	216.3766	229.7155	201.4245	194.9226	175.2661	172.6232	179.6331	181.7921	203.1802	216.6426	241.9110	241.9110	(62)	
WWHRS	-28.0247	-24.7853	-25.9537	-21.4907	-20.0285	-17.1386	-16.0647	-17.0832	-17.7322	-20.9043	-23.6821	-27.5057	(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														
216.6452	191.5913	203.7618	179.9339	174.8940	158.1275	156.5585	162.5499	164.0599	182.2759	192.9605	214.4053	214.4053	(64)	
12Total per year (kWh/year)									Total per year (kWh/year) = Sum(64)m =			2197.7637	(64)	
Electric shower(s)												2198	(64)	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	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														
103.1358	91.6203	98.1635	88.0541	86.5949	79.3564	79.1803	81.5111	81.5263	89.3405	93.1141	102.2185	102.2185	(65)	

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

Metabolic gains (Table 5), Watts													
(66)m	Jan 110.5831	Feb 110.5831	Mar 110.5831	Apr 110.5831	May 110.5831	Jun 110.5831	Jul 110.5831	Aug 110.5831	Sep 110.5831	Oct 110.5831	Nov 110.5831	Dec 110.5831	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
97.8973	108.3863	97.8973	101.1606	97.8973	101.1606	97.8973	97.8973	101.1606	97.8973	101.1606	97.8973	97.8973	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
194.0077	196.0209	190.9477	180.1475	166.5142	153.7008	145.1407	143.1275	148.2007	159.0009	172.6342	185.4476	185.4476	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
34.0583	34.0583	34.0583	34.0583	34.0583	34.0583	34.0583	34.0583	34.0583	34.0583	34.0583	34.0583	34.0583	(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)

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Losses e.g. evaporation (negative values) (Table 5)	-88.4665	-88.4665	-88.4665	-88.4665	-88.4665	-88.4665	-88.4665	-88.4665	-88.4665	-88.4665	-88.4665	-88.4665 (71)
Water heating gains (Table 5)	138.6234	136.3397	131.9402	122.2974	116.3910	110.2172	106.4252	109.5580	113.2310	120.0814	129.3251	137.3905 (72)
Total internal gains	489.7034	499.9219	479.9602	462.7804	439.9774	421.2535	405.6381	406.7577	418.7672	436.1545	462.2948	479.9104 (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	
South				11.9400	46.7521		0.6300	0.7000	0.7700		170.5992 (78)	
West				3.1100	19.6403		0.6300	0.7000	0.7700		18.6672 (80)	
Solar gains	189.2664	315.9145	416.0412	489.9557	526.6565	513.4258	498.8952	472.7474	441.7259	344.6870	225.4940	162.7644 (83)
Total gains	678.9698	815.8364	896.0014	952.7361	966.6339	934.6794	904.5333	879.5051	860.4931	780.8415	687.7889	642.6748 (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	15.4635	15.4958	15.5276	15.6786	15.7072	15.8417	15.8417	15.8668	15.7896	15.7072	15.6495	15.5896
alpha	2.0309	2.0331	2.0352	2.0452	2.0471	2.0561	2.0561	2.0578	2.0526	2.0471	2.0433	2.0393
util living area	0.8653	0.8162	0.7627	0.6855	0.5895	0.4676	0.3576	0.3792	0.5235	0.7007	0.8208	0.8763 (86)
MIT	18.1147	18.5835	19.1318	19.7682	20.3031	20.6982	20.8761	20.8554	20.5931	19.8944	18.9066	18.0256 (87)
Th 2	19.9093	19.9113	19.9133	19.9226	19.9244	19.9325	19.9325	19.9340	19.9294	19.9244	19.9208	19.9172 (88)
util rest of house	0.8514	0.7984	0.7397	0.6542	0.5459	0.4070	0.2813	0.3033	0.4649	0.6645	0.8004	0.8634 (89)
MIT 2	16.6119	17.1850	17.8549	18.6246	19.2496	19.6874	19.8570	19.8417	19.5816	18.7931	17.6006	16.5051 (90)
Living area fraction									fLA = Living area / (4) =			0.5569 (91)
MIT	17.4487	17.9637	18.5659	19.2614	19.8362	20.2503	20.4244	20.4062	20.1449	19.4064	18.3279	17.3518 (92)
Temperature adjustment												0.0000
adjusted MIT	17.4487	17.9637	18.5659	19.2614	19.8362	20.2503	20.4244	20.4062	20.1449	19.4064	18.3279	17.3518 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.8117	0.7600	0.7066	0.6329	0.5421	0.4258	0.3175	0.3380	0.4773	0.6450	0.7639	0.8243 (94)
Useful gains	551.1516	620.0351	633.1442	602.9664	524.0030	397.9745	287.1616	297.2527	410.7468	503.6443	525.4239	529.7264 (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	1094.4555	1085.1135	1000.1800	850.6142	666.7243	459.0814	310.7338	324.9861	492.7610	721.6373	923.4614	1085.8560 (97)
Space heating kWh	404.2181	312.5327	273.0746	178.3064	106.1847	0.0000	0.0000	0.0000	0.0000	162.1868	286.5870	413.7604 (98a)
Space heating requirement - total per year (kWh/year)												2136.8506
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)												0.0000
Space heating kWh	404.2181	312.5327	273.0746	178.3064	106.1847	0.0000	0.0000	0.0000	0.0000	162.1868	286.5870	413.7604 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2136.8506
Space heating per m2										(98c) / (4) =		31.1494 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												92.3000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	404.2181	312.5327	273.0746	178.3064	106.1847	0.0000	0.0000	0.0000	0.0000	162.1868	286.5870	413.7604 (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)	437.9395	338.6053	295.8554	193.1814	115.0430	0.0000	0.0000	0.0000	0.0000	175.7170	310.4951	448.2777 (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	216.6452	191.5913	203.7618	179.9339	174.8940	158.1275	156.5585	162.5499	164.0599	182.2759	192.9605	214.4053 (64)
Efficiency of water heater (217)m	85.4377	85.1502	84.7171	84.0394	82.9770	79.8000	79.8000	79.8000	79.8000	83.7989	84.9451	79.8000 (216)
Fuel for water heating, kWh/month	253.5710	225.0038	240.5201	214.1065	210.7740	198.1547	196.1886	203.6967	205.5888	217.5159	227.1591	250.7419 (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	20.3411	16.3184	14.6929	10.7647	8.3149	6.7934	7.5852	9.8595	12.8065	16.8028	18.9787	20.9065 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-53.4034	-70.4071	-94.7555	-99.5917	-101.9525	-93.3416	-92.1918	-89.5894	-84.3595	-77.0462	-56.9515	-46.7686 (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)

Full SAP Calculation Printout



Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)														
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)														
(233b)m	-47.0405	-96.3626	-186.9429	-274.4175	-356.9365	-356.4914	-352.2599	-300.8667	-224.1062	-135.5230	-62.0254	-37.3954	(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													2315.1144	(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													2643.0213	(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)													164.1646	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV generation													-3390.7268	(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													1817.5735	(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	2315.1144	0.2100	486.1740	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2643.0213	0.2100	555.0345	(264)
Space and water heating			1041.2085	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	164.1646	0.1443	23.6940	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-960.3587	0.1360	-130.6282	
PV Unit electricity exported	-2430.3680	0.1266	-307.6542	
Total			-438.2824	(269)
Total CO2, kg/year			638.5494	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.3100	(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	2315.1144	1.1300	2616.0793	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2643.0213	1.1300	2986.6140	(278)
Space and water heating			5602.6933	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	164.1646	1.5338	251.8011	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-960.3587	1.5028	-1443.2131	
PV Unit electricity exported	-2430.3680	0.4647	-1129.3774	
Total			-2572.5905	(283)
Total Primary energy kWh/year			3412.0047	(286)
Target Primary Energy Rate (TPER)			49.7400	(287)