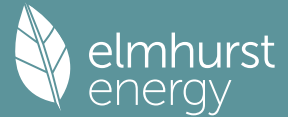


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Property Reference	UNIT 36				Issued on Date	02/07/2025	
Assessment Reference	UNIT 36			Prop Type Ref			
Property	Flat 37, Alexander House, 205 Kings Road, READING, RG1 4FW						
SAP Rating	85 B	DER	3.70	TER	10.60		
Environmental	97 A	% DER < TER				65.09	
CO ₂ Emissions (t/year)	0.24	DFEE	39.11	TFEE	44.96		
Compliance Check	See BREL	% DFEE < TFEE				13.01	
% DPER < TPER	31.35	DPER	38.92	TPER	56.70		
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			
Ground floor	71.2000 (1b)	2.5000 (2b)	178.0000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.2000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	178.0000 (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	3.3700	(17)
Infiltration rate	0.1685	(18)
Number of sides sheltered	2	(19)

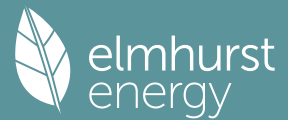
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1432 (21)

	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	0.1826	0.1790	0.1755	0.1575	0.1540	0.1361	0.1361	0.1325	0.1432	0.1540	0.1611	0.1683 (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	0.2866	0.2830	0.2795	0.2615	0.2580	0.2401	0.2401	0.2365	0.2472	0.2580	0.2651	0.2723 (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			6.5000	1.1450	7.4427		(27)
3			6.5000	1.1450	7.4427		(27)
1			2.1000	1.0000	2.1000		(26)
top floor exposed new	58.7500	19.5000	39.2500	0.2000	7.8500	18.0000	706.5000 (29a)
corridor new	9.7500	2.1000	7.6500	0.2300	1.7595	14.0000	107.1000 (29a)
flat roof new	39.1000		39.1000	0.1300	5.0830	9.0000	351.9000 (30)
roof terrace new	32.1000		32.1000	0.1300	4.1730	9.0000	288.9000 (30)
Total net area of external elements A _{um} (A, m ²)			139.7000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	43.2937		(33)
Main dwelling							
pw			16.0000	0.0000	0.0000	20.0000	320.0000 (32)
pf			71.2000			30.0000	2136.0000 (32d)
iw			105.5000			9.0000	949.5000 (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) = 4859.9000 (34)
List of Thermal Bridges 68.2570 (35)

	Length	Psi-value	Total
K1 Element	8.8000	0.0470	0.4136
E2 Other lintels (including other steel lintels)	7.8000	0.0150	0.1170
E3 Sill	19.2000	0.0470	0.9024
E4 Jamb	0.0000	0.2800	0.0000
E7 Party floor between dwellings (in blocks of flats)	24.0000	0.1970	4.7280
E15 Flat roof with parapet	5.0000	0.1800	0.9000
E16 Corner (normal)	0.0000	0.0000	0.0000
E17 Corner (inverted - internal area greater than external area)	5.0000	0.2400	1.2000
E18 Party wall between dwellings	24.0000	0.0500	1.2000
E24 Eaves (insulation at ceiling level - inverted)			9.4610 (36)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			0.0000
Point Thermal Bridges			(36a) =
Total fabric heat loss			(33) + (36) + (36a) = 52.7547 (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	16.8356	16.6253	16.4149	15.3633	15.1530	14.1013	14.1013	13.8910	14.5220	15.1530	15.5736	15.9943	(38)
Heat transfer coeff	69.5903	69.3800	69.1697	68.1180	67.9077	66.8561	66.8561	66.6458	67.2767	67.9077	68.3284	68.7490	(39)
Average = $\text{Sum}(39)\text{m} / 12 =$												68.0655	
HLP	0.9774	0.9744	0.9715	0.9567	0.9538	0.9390	0.9390	0.9360	0.9449	0.9538	0.9597	0.9656	(40)
HLP (average)												0.9560	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.2749 (42)
Hot water usage for mixer showers	62.3623	61.4251	60.0594	57.4465	55.5182	53.3678	52.1455	53.5008	54.9865	57.2954	59.9645	62.1233	(42a)
Hot water usage for baths	26.9410	26.5409	25.9775	24.9386	24.1607	23.2981	22.8322	23.3917	24.0009	24.9239	25.9842	26.8500	(42b)
Hot water usage for other uses	37.9273	36.5481	35.1689	33.7897	32.4106	31.0314	31.0314	32.4106	33.7897	35.1689	36.5481	37.9273	(42c)
Average daily hot water use (litres/day)												116.9539	(43)
Daily hot water use	127.2306	124.5141	121.2058	116.1748	112.0895	107.6973	106.0091	109.3031	112.7772	117.3882	122.4967	126.9006	(44)
Energy conte	201.5022	177.3065	186.2889	159.0376	150.8940	132.4264	128.2088	135.3401	139.0655	159.2947	174.5191	198.6956	(45)
Energy content (annual)										Total =	Sum(45)m =	1942.5793	
Distribution loss (46)m = $0.15 \times (45)\text{m}$	30.2253	26.5960	27.9433	23.8556	22.6341	19.8640	19.2313	20.3010	20.8598	23.8942	26.1779	29.8043	(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	250.7116	221.7537	235.4983	206.6596	200.1034	180.0484	177.4182	184.5495	186.6875	208.5041	222.1411	247.9050	(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	250.7116	221.7537	235.4983	206.6596	200.1034	180.0484	177.4182	184.5495	186.6875	208.5041	222.1411	247.9050	(64)
12Total per year (kWh/year)										Total per year (kWh/year) =	Sum(64)m =	2521.9803	(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	106.3670	94.5122	101.3086	90.9776	89.5398	82.1294	81.9970	84.3681	84.3369	92.3330	96.1252	105.4338	(65)

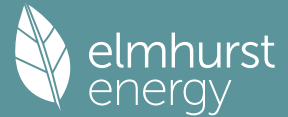
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
(66)m	113.7451	113.7451	113.7451	113.7451	113.7451	113.7451	113.7451	113.7451	113.7451	113.7451	113.7451	113.7451	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	100.9181	111.7307	100.9181	104.2820	100.9181	104.2820	100.9181	100.9181	104.2820	100.9181	104.2820	100.9181	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	200.0814	202.1576	196.9256	185.7873	171.7272	158.5126	149.6845	147.6083	152.8403	163.9786	178.0387	191.2533	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.3745	34.3745	34.3745	34.3745	34.3745	34.3745	34.3745	34.3745	34.3745	34.3745	34.3745	34.3745	(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)	-90.9961	-90.9961	-90.9961	-90.9961	-90.9961	-90.9961	-90.9961	-90.9961	-90.9961	-90.9961	-90.9961	-90.9961	(71)
Water heating gains (Table 5)	142.9664	140.6431	136.1674	126.3578	120.3492	114.0686	110.2110	113.3980	117.1346	124.1035	133.5072	141.7121	(72)
Total internal gains	501.0894	511.6550	491.1347	473.5506	450.1180	433.9868	417.9371	419.0479	431.3804	446.1237	472.9515	491.0070	(73)

6. Solar gains

[Jan]	Area m ²	Solar flux Table 6a W/m ²	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
North	6.5000	10.6334	0.6300	0.8000	0.7700	24.1406 (74)
South	6.5000	46.7521	0.6300	0.8000	0.7700	106.1397 (78)

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North	6.5000		10.6334		0.6300		0.8000		0.7700		24.1406 (74)	
Solar gains	154.4210	266.0975	378.2139	502.1001	600.0375	614.1497	584.2877	507.1488	419.8152	297.3245	185.3730	131.9642 (83)
Total gains	655.5104	777.7525	869.3486	975.6507	1050.1555	1048.1364	1002.2248	926.1968	851.1956	743.4482	658.3245	622.9712 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	19.3988	19.4577	19.5168	19.8181	19.8795	20.1922	20.1922	20.2559	20.0660	19.8795	19.7571	19.6362
alpha	2.2933	2.2972	2.3011	2.3212	2.3253	2.3461	2.3461	2.3504	2.3377	2.3253	2.3171	2.3091
util living area	0.8618	0.8103	0.7452	0.6381	0.5113	0.3772	0.2816	0.3141	0.4761	0.6811	0.8134	0.8728 (86)
Living	18.7169	19.1365	19.6387	20.2217	20.6344	20.8732	20.9536	20.9391	20.7713	20.2276	19.4034	18.6505
Non living	17.4392	17.9576	18.5748	19.2822	19.7596	20.0273	20.1038	20.0949	19.9253	19.3088	18.3069	17.3627
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	19.8321	19.1365	19.6387	20.2217	20.6344	20.8732	20.9536	20.9391	20.7713	20.2276	19.4034	18.9792 (87)
Th 2	20.1022	20.1047	20.1072	20.1196	20.1220	20.1345	20.1345	20.1370	20.1295	20.1220	20.1171	20.1121 (88)
util rest of house	0.8492	0.7942	0.7242	0.6100	0.4750	0.3325	0.2297	0.2598	0.4284	0.6492	0.7951	0.8611 (89)
MIT 2	19.0404	17.9576	18.5748	19.2822	19.7596	20.0273	20.1038	20.0949	19.9253	19.3088	18.3069	17.8582 (90)
Living area fraction	FLA = Living area / (4) =											
MIT	19.3995	18.4924	19.0574	19.7084	20.1565	20.4111	20.4894	20.4779	20.3091	19.7256	18.8043	18.3667 (92)
Temperature adjustment	0.0000											
adjusted MIT	19.3995	18.4924	19.0574	19.7084	20.1565	20.4111	20.4894	20.4779	20.3091	19.7256	18.8043	18.3667 (93)

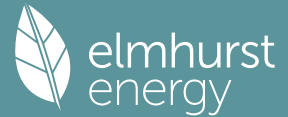
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8384	0.7606	0.6968	0.5960	0.4765	0.3471	0.2513	0.2816	0.4386	0.6335	0.7631	0.8337 (94)
Useful gains	549.5506	591.5582	605.7356	581.5285	500.3895	363.7867	251.8116	260.8329	373.3151	470.9659	502.3908	519.3521 (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	1050.7819	943.0400	868.5931	736.2491	574.2587	388.5049	260.0272	271.7719	417.7277	619.6979	799.7376	973.9469 (97)
Space heating kWh	372.9161	236.1957	195.5660	111.3988	54.9587	0.0000	0.0000	0.0000	0.0000	110.6567	214.0897	338.2185 (98a)
Space heating requirement - total per year (kWh/year)	1634.0002											
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	372.9161	236.1957	195.5660	111.3988	54.9587	0.0000	0.0000	0.0000	0.0000	110.6567	214.0897	338.2185 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	1634.0002											
Space heating per m2	(98c) / (4) = 22.9494 (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 %)												232.3946 (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	372.9161	236.1957	195.5660	111.3988	54.9587	0.0000	0.0000	0.0000	0.0000	110.6567	214.0897	338.2185 (98)
Space heating efficiency (main heating system 1)	232.3946	232.3946	232.3946	232.3946	232.3946	0.0000	0.0000	0.0000	0.0000	232.3946	232.3946	232.3946 (210)
Space heating fuel (main heating system)	160.4668	101.6357	84.1526	47.9352	23.6489	0.0000	0.0000	0.0000	0.0000	47.6159	92.1234	145.5363 (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	250.7116	221.7537	235.4983	206.6596	200.1034	180.0484	177.4182	184.5495	186.6875	208.5041	222.1411	247.9050 (64)
Efficiency of water heater (217)m	321.8153	321.8153	321.8153	321.8153	321.8153	321.8153	321.8153	321.8153	321.8153	321.8153	321.8153	321.8153 (216)
Fuel for water heating, kWh/month	77.9054	68.9071	73.1781	64.2168	62.1796	55.9478	55.1305	57.3464	58.0108	64.7900	69.0275	77.0333 (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	12.4495	11.2447	12.4495	12.0479	12.4495	12.0479	12.4495	12.4495	12.0479	12.4495	12.0479	12.4495 (231)
Lighting	20.1592	16.1725	14.5615	10.6684	8.2406	6.7326	7.5173	9.7713	12.6920	16.6525	18.8090	20.7195 (232)
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 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	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)	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	703.1146 (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	321.8153
Water heating fuel used	783.6733 (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)	146.5830 (230a)
Total electricity for the above, kWh/year	146.5830 (231)
Electricity for lighting (calculated in Appendix L)	162.6965 (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	1796.0674 (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	703.1146	0.1556	109.3783 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	783.6733	0.1409	110.4350 (264)
Space and water heating			219.8134 (265)
Pumps, fans and electric keep-hot	146.5830	0.1387	20.3329 (267)
Energy for lighting	162.6965	0.1443	23.4821 (268)
Total CO2, kg/year			263.6284 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.7000 (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	703.1146	1.5759	1108.0140 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	783.6733	1.5211	1192.0228 (278)
Space and water heating			2300.0368 (279)
Pumps, fans and electric keep-hot	146.5830	1.5128	221.7508 (281)
Energy for lighting	162.6965	1.5338	249.5493 (282)
Total Primary energy kWh/year			2771.3369 (286)
Dwelling Primary energy Rate (DPER)			38.9200 (287)

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

1. Overall dwelling characteristics

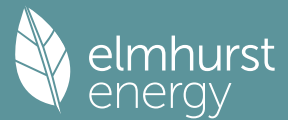
	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	71.2000 (1b)	x 2.5000 (2b)	= 178.0000 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.2000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 178.0000 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) = 30.0000 / (5) = 0.1685 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4185 (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) = 0.3558 (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	0.4536	0.4447	0.4358	0.3913	0.3824	0.3380	0.3380	0.3291	0.3558	0.3824	0.4002	0.4180 (22b)
Effective ac	0.6029	0.5989	0.5950	0.5766	0.5731	0.5571	0.5571	0.5541	0.5633	0.5731	0.5801	0.5874 (25)

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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			2.1000	1.0000	2.1000			(26)					
TER Opening Type			15.6900	1.1450	17.9656			(27)					
top floor exposed new	58.7500	15.6900	43.0600	0.1800	7.7508			(29a)					
corridor new	9.7500	2.1000	7.6500	0.1800	1.3770			(29a)					
flat roof new	39.1000		39.1000	0.1100	4.3010			(30)					
roof terrace new	32.1000		32.1000	0.1100	3.5310			(30)					
Total net area of external elements Aum(A, m2)			139.7000					(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	37.0254			(33)					
Main dwelling													
pw			16.0000	0.0000	0.0000			(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							68.2570	(35)					
List of Thermal Bridges													
K1 Element				Length	Psi-value	Total							
E2 Other lintels (including other steel lintels)				8.8000	0.0500	0.4400							
E3 Sill				7.8000	0.0500	0.3900							
E4 Jamb				19.2000	0.0500	0.9600							
E7 Party floor between dwellings (in blocks of flats)				0.0000	0.0700	0.0000							
E15 Flat roof with parapet				24.0000	0.5600	13.4400							
E16 Corner (normal)				5.0000	0.0900	0.4500							
E17 Corner (inverted - internal area greater than external area)				0.0000	-0.0900	-0.0000							
E18 Party wall between dwellings				5.0000	0.0600	0.3000							
E24 Eaves (insulation at ceiling level - inverted)				24.0000	0.2400	5.7600							
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							21.7400	(36)					
Point Thermal bridges						(36a) =	0.0000						
Total fabric heat loss						(33) + (36) + (36a) =	58.7654	(37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 35.4127	Feb 35.1781	Mar 34.9481	Apr 33.8678	May 33.6657	Jun 32.7248	Jul 32.7248	Aug 32.5505	Sep 33.0872	Oct 33.6657	Nov 34.0746	Dec 34.5020	(38)
Heat transfer coeff	94.1782	93.9436	93.7136	92.6332	92.4311	91.4902	91.4902	91.3160	91.8526	92.4311	92.8400	93.2675	(39)
Average = Sum(39)m / 12 =												92.6323	
HLP	Jan 1.3227	Feb 1.3194	Mar 1.3162	Apr 1.3010	May 1.2982	Jun 1.2850	Jul 1.2850	Aug 1.2825	Sep 1.2901	Oct 1.2982	Nov 1.3039	Dec 1.3099	(40)
HLP (average)												1.3010	
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	

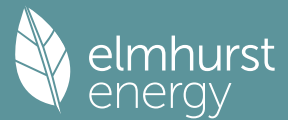
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.2749	(42)
Hot water usage for mixer showers	62.3623	61.4251	60.0594	57.4465	55.5182	53.3678	52.1455	53.5008	54.9865	57.2954	59.9645	62.1233	(42a)	
Hot water usage for baths	26.9410	26.5409	25.9775	24.9386	24.1607	23.2981	22.8322	23.3917	24.0009	24.9239	25.9842	26.8500	(42b)	
Hot water usage for other uses	37.9273	36.5481	35.1689	33.7897	32.4106	31.0314	31.0314	32.4106	33.7897	35.1689	36.5481	37.9273	(42c)	
Average daily hot water use (litres/day)													116.9539	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Daily hot water use	127.2306	124.5141	121.2058	116.1748	112.0895	107.6973	106.0091	109.3031	112.7772	117.3882	122.4967	126.9006	(44)	
Energy content (annual)	201.5022	177.3065	186.2889	159.0376	150.8940	132.4264	128.2088	135.3401	139.0655	159.2947	174.5191	198.6956	(45)	
Distribution loss (46)m = 0.15 x (45)m	30.2253	26.5960	27.9433	23.8556	22.6341	19.8640	19.2313	20.3010	20.8598	23.8942	26.1779	29.8043	(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	(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	(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	248.0971	219.3922	232.8838	204.1294	197.4889	177.5183	174.8037	181.9350	184.1574	205.8896	219.6109	245.2905	(62)	
WWHRS	-28.5094	-25.2140	-26.4026	-21.8624	-20.3750	-17.4350	-16.3426	-17.3787	-18.0389	-21.2659	-24.0917	-27.9815	(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	219.5876	194.1782	206.4812	182.2670	177.1139	160.0832	158.4612	164.5563	166.1184	184.6237	195.5192	217.3091	(64)	
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2226.2990	(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	104.2754	92.6230	99.2170	88.9535	87.4482	80.1053	79.9054	82.2765	82.3128	90.2414	94.1011	103.3422	(65)	

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

Metabolic gains (Table 5), Watts													
(66)m	Jan 113.7451	Feb 113.7451	Mar 113.7451	Apr 113.7451	May 113.7451	Jun 113.7451	Jul 113.7451	Aug 113.7451	Sep 113.7451	Oct 113.7451	Nov 113.7451	Dec 113.7451	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	100.9476	111.7635	100.9476	104.3126	100.9476	104.3126	100.9476	100.9476	104.3126	100.9476	104.3126	100.9476	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	200.0814	202.1576	196.9256	185.7873	171.7272	158.5126	149.6845	147.6083	152.8403	163.9786	178.0387	191.2533	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.3745	34.3745	34.3745	34.3745	34.3745	34.3745	34.3745	34.3745	34.3745	34.3745	34.3745	34.3745	(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)	-90.9961	-90.9961	-90.9961	-90.9961	-90.9961	-90.9961	-90.9961	-90.9961	-90.9961	-90.9961	-90.9961	-90.9961 (71)
Water heating gains (Table 5)	140.1551	137.8318	133.3561	123.5465	117.5379	111.2573	107.3997	110.5867	114.3233	121.2922	130.6959	138.9008 (72)
Total internal gains	501.3077	511.8764	491.3529	473.7699	450.3362	431.2060	415.1554	416.2662	428.5997	446.3420	473.1708	491.2253 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
North				10.4600	10.6334	0.6300	0.7000	0.7700	33.9919 (74)			
South				5.2300	46.7521	0.6300	0.7000	0.7700	74.7264 (78)			
Solar gains	108.7183	187.3429	266.2771	353.4978	422.4495	432.3850	411.3610	357.0523	295.5660	209.3279	130.5097	92.9078 (83)
Total gains	610.0260	699.2193	757.6301	827.2676	872.7857	863.5910	826.5164	773.3185	724.1657	655.6699	603.6805	584.1331 (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	14.3342	14.3700	14.4053	14.5733	14.6052	14.7554	14.7554	14.7835	14.6972	14.6052	14.5408	14.4742
alpha	1.9556	1.9580	1.9604	1.9716	1.9737	1.9837	1.9837	1.9856	1.9798	1.9737	1.9694	1.9649
util living area	0.8977	0.8678	0.8289	0.7579	0.6587	0.5309	0.4191	0.4551	0.6193	0.7801	0.8668	0.9047 (86)
MIT	17.6261	18.0151	18.5880	19.3597	20.0532	20.5751	20.8123	20.7719	20.3817	19.5044	18.4551	17.5639 (87)
Th 2	19.8231	19.8256	19.8282	19.8400	19.8423	19.8526	19.8526	19.8545	19.8486	19.8423	19.8378	19.8331 (88)
util rest of house	0.8859	0.8528	0.8088	0.7282	0.6135	0.4631	0.3282	0.3642	0.5559	0.7468	0.8493	0.8936 (89)
MIT 2	15.9840	16.4633	17.1694	18.1102	18.9273	19.5105	19.7409	19.7110	19.3178	18.3057	17.0224	15.9099 (90)
Living area fraction	16.7290	17.1673	17.8130	18.6770	19.4381	19.9935	20.2269	20.1923	19.8004	18.8495	17.6724	16.6602 (92)
MIT	16.7290	17.1673	17.8130	18.6770	19.4381	19.9935	20.2269	20.1923	19.8004	18.8495	17.6724	16.6602 (93)
Temperature adjustment												0.0000
adjusted MIT	16.7290	17.1673	17.8130	18.6770	19.4381	19.9935	20.2269	20.1923	19.8004	18.8495	17.6724	16.6602 (93)

8. Space heating requirement

Utilisation	0.8433	0.8085	0.7656	0.6930	0.5960	0.4720	0.3594	0.3926	0.5529	0.7124	0.8065	0.8520 (94)
Useful gains	514.4334	565.2995	580.0615	573.3261	520.1499	407.6030	297.0531	303.6283	400.4238	467.1027	486.8722	497.6977 (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	1170.5375	1152.4298	1060.1813	905.6762	715.2385	493.4489	331.8301	346.2983	523.6007	762.5095	981.5384	1162.1347 (97)
Space heating kWh	488.1414	394.5516	357.2091	239.2921	145.1459	0.0000	0.0000	0.0000	0.0000	219.7826	356.1596	494.3412 (98a)
Space heating requirement - total per year (kWh/year)												2694.6237
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	488.1414	394.5516	357.2091	239.2921	145.1459	0.0000	0.0000	0.0000	0.0000	219.7826	356.1596	494.3412 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2694.6237
Space heating per m ²										(98c) / (4) =		37.8458 (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)
Space heating requirement	488.1414	394.5516	357.2091	239.2921	145.1459	0.0000	0.0000	0.0000	0.0000	219.7826	356.1596	494.3412 (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)	528.8640	427.4665	387.0088	259.2548	157.2545	0.0000	0.0000	0.0000	0.0000	238.1177	385.8718	535.5809 (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	219.5876	194.1782	206.4812	182.2670	177.1139	160.0832	158.4612	164.5563	166.1184	184.6237	195.5192	217.3091 (64)
Efficiency of water heater (217)m	85.7977	85.6153	85.2770	84.6712	83.6170	79.8000	79.8000	79.8000	79.8000	84.4517	85.3870	79.8000 (216)
Fuel for water heating, kWh/month	255.9365	226.8033	242.1299	215.2645	211.8156	200.6056	198.5729	206.2109	208.1684	218.6145	228.9800	253.1452 (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	20.9749	16.8269	15.1507	11.1001	8.5740	7.0050	7.8215	10.1667	13.2055	17.3264	19.5701	21.5579 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-55.2723	-72.7966	-97.8683	-102.7451	-105.0771	-96.1554	-94.9603	-92.3248	-87.0169	-79.5887	-58.9118	-48.4136 (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)

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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	-48.9785	-100.2938	-194.5067	-285.4394	-371.2042	-370.7266	-366.3365	-312.9300	-233.1399	-141.0371	-64.5743	-38.9402	(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													2919.4189	(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													2666.2474	(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)													169.2797	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV generation													-3519.2382	(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													2321.7078	(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	2919.4189	0.2100	613.0780	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2666.2474	0.2100	559.9120	(264)
Space and water heating			1172.9899	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	169.2797	0.1443	24.4323	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-991.1310	0.1360	-134.8403	
PV Unit electricity exported	-2528.1072	0.1266	-320.0471	
Total			-454.8874	(269)
Total CO2, kg/year			754.4641	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.6000	(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	2919.4189	1.1300	3298.9434	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2666.2474	1.1300	3012.8596	(278)
Space and water heating			6311.8030	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	169.2797	1.5338	259.6468	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-991.1310	1.5029	-1489.5563	
PV Unit electricity exported	-2528.1072	0.4647	-1174.8717	
Total			-2664.4280	(283)
Total Primary energy kWh/year			4037.1226	(286)
Target Primary Energy Rate (TPER)			56.7000	(287)