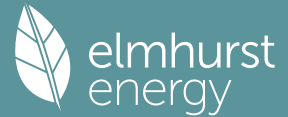


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Property Reference	UNIT 42				Issued on Date	02/07/2025	
Assessment Reference	UNIT 42			Prop Type Ref			
Property	Flat 43, Alexander House, 205 Kings Road, READING, RG1 4FW						
SAP Rating	84 B	DER	5.23	TER	15.37		
Environmental	97 A	% DER < TER				65.97	
CO ₂ Emissions (t/year)	0.19	DFEE	48.43	TFEE	50.07		
Compliance Check	See BREL	% DFEE < TFEE				3.26	
% DPER < TPER	33.10	DPER	54.92	TPER	82.09		
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	39.5000 (1b)	2.5000 (2b)	98.7500 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	39.5000		98.7500 (4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	98.7500 (5)

2. Ventilation rate

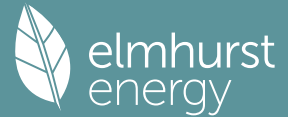
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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	4.0000 (17)
Infiltration rate	0.2000 (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) = 0.1700 (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	0.2167	0.2125	0.2083	0.1870	0.1827	0.1615	0.1615	0.1573	0.1700	0.1827	0.1913	0.1998 (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	0.3207	0.3165	0.3123	0.2910	0.2867	0.2655	0.2655	0.2612	0.2740	0.2867	0.2953	0.3037 (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)
1			2.1000	1.0000	2.1000		(26)
top floor exposed new	33.5000	13.0000	20.5000	0.2000	4.1000	18.0000	369.0000 (29a)
corridor new	26.2500	2.1000	24.1500	0.2300	5.5545	14.0000	338.1000 (29a)
flat roof new	21.9000		21.9000	0.1300	2.8470	9.0000	197.1000 (30)
roof terrace new	17.6000		17.6000	0.1300	2.2880	9.0000	158.4000 (30)
Total net area of external elements A _{um} (A, m ²)			99.2500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	31.7750		(33)
Main dwelling							
pw			10.7500	0.0000	0.0000	20.0000	215.0000 (32)
pf			39.5000			30.0000	1185.0000 (32d)
iw			49.0000			9.0000	441.0000 (32c)
Heat capacity C _m = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	2903.6000 (34)

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Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K												73.5089 (35)	
List of Thermal Bridges													
K1 Element								Length	Psi-value	Total			
E2 Other lintels (including other steel lintels)								6.2000	0.0470	0.2914			
E3 Sill								5.2000	0.0150	0.0780			
E4 Jamb								14.2000	0.0470	0.6674			
E15 Flat roof with parapet								13.6000	0.1970	2.6792			
E16 Corner (normal)								2.5000	0.1800	0.4500			
E18 Party wall between dwellings								5.0000	0.2400	1.2000			
E24 Eaves (insulation at ceiling level - inverted)								13.6000	0.0500	0.6800			
Thermal bridges (Sum(L x Psi) calculated using Appendix K)											6.0460 (36)		
Point Thermal bridges											(36a) = 0.0000		
Total fabric heat loss											(33) + (36) + (36a) = 37.8210 (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	
	10.4524	10.3139	10.1754	9.4830	9.3445	8.6520	8.6520	8.5135	8.9290	9.3445	9.6215	9.8985 (38)	
Heat transfer coeff	48.2734	48.1349	47.9964	47.3040	47.1655	46.4730	46.4730	46.3345	46.7500	47.1655	47.4425	47.7194 (39)	
Average = Sum(39)m / 12 =												47.2693	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	1.2221	1.2186	1.2151	1.1976	1.1941	1.1765	1.1765	1.1730	1.1835	1.1941	1.2011	1.2081 (40)	
HLP (average)												1.1967	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

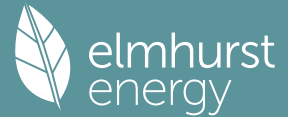
4. Water heating energy requirements (kWh/year)													
Assumed occupancy													1.3931 (42)
Hot water usage for mixer showers													
	47.5773	46.8623	45.8204	43.8269	42.3558	40.7152	39.7827	40.8167	41.9502	43.7117	45.7480	47.3950 (42a)	
Hot water usage for baths													
	20.5830	20.2773	19.8469	19.0532	18.4588	17.7998	17.4439	17.8713	18.3367	19.0419	19.8520	20.5134 (42b)	
Hot water usage for other uses													
	28.8968	27.8461	26.7953	25.7445	24.6937	23.6429	23.6429	24.6937	25.7445	26.7953	27.8461	28.8968 (42c)	
Average daily hot water use (litres/day)												89.2182 (43)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	97.0572	94.9857	92.4625	88.6246	85.5083	82.1579	80.8695	83.3817	86.0314	89.5488	93.4460	96.8053 (44)	
Energy conte	153.7148	135.2583	142.1115	121.3226	115.1106	101.0228	97.8046	103.2440	106.0853	121.5169	133.1309	151.5737 (45)	
Energy content (annual)												Total = Sum(45)m = 1481.8960	
Distribution loss (46)m = 0.15 x (45)m													
	23.0572	20.2888	21.3167	18.1984	17.2666	15.1534	14.6707	15.4866	15.9128	18.2275	19.9696	22.7361 (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													
	202.9242	179.7055	191.3209	168.9446	164.3200	148.6448	147.0140	152.4534	153.7073	170.7263	180.7529	200.7831 (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)	
FV 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	202.9242	179.7055	191.3209	168.9446	164.3200	148.6448	147.0140	152.4534	153.7073	170.7263	180.7529	200.7831 (64)	
											Total per year (kWh/year) = Sum(64)m = 2061.2970 (64)	2061 (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													
	90.4777	80.5312	86.6196	78.4374	77.6418	71.6877	71.8876	73.6961	73.3710	79.7719	82.3636	89.7658 (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	
	69.6555	69.6555	69.6555	69.6555	69.6555	69.6555	69.6555	69.6555	69.6555	69.6555	69.6555	69.6555 (66)	
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	60.6664	67.1664	60.6664	62.6886	60.6664	62.6886	60.6664	60.6664	62.6886	60.6664	62.6886	60.6664 (67)	
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	120.2780	121.5261	118.3809	111.6852	103.2330	95.2891	89.9821	88.7340	91.8792	98.5750	107.0272	114.9710 (68)	
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	29.9656	29.9656	29.9656	29.9656	29.9656	29.9656	29.9656	29.9656	29.9656	29.9656	29.9656	29.9656 (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)													
	-55.7244	-55.7244	-55.7244	-55.7244	-55.7244	-55.7244	-55.7244	-55.7244	-55.7244	-55.7244	-55.7244	-55.7244 (71)	
Water heating gains (Table 5)													
	121.6098	119.8380	116.4242	108.9408	104.3573	99.5662	96.6231	99.0540	101.9041	107.2203	114.3939	120.6529 (72)	
Total internal gains	346.4509	352.4272	339.3682	327.2112	312.1533	301.4406	291.1683	292.3511	300.3687	310.3584	328.0064	340.1870 (73)	

6. Solar gains													
[Jan]	Area	Solar flux	g	FF	Access	Gains							
	m2	Table 6a	Specific data	Specific data	factor	W							
		W/m2	or Table 6b	or Table 6c	Table 6d								
East	6.5000	19.6403	0.6300	0.8000	0.7700	44.5887 (76)							
East	6.5000	19.6403	0.6300	0.8000	0.7700	44.5887 (76)							

Solar gains	89.1773	174.4498	287.2939	419.0010	513.5015	525.6602	500.4499	429.8791	334.1347	206.9993	111.1936	73.3351 (83)	

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Total gains 435.6282 526.8770 626.6621 746.2123 825.6549 827.1008 791.6182 722.2302 634.5034 517.3577 439.2000 413.5221 (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	16.7081	16.7561	16.8045	17.0505	17.1006	17.3554	17.3554	17.4072	17.2525	17.1006	17.0007	16.9020
alpha	2.1139	2.1171	2.1203	2.1367	2.1400	2.1570	2.1570	2.1605	2.1502	2.1400	2.1334	2.1268
util living area	0.8533	0.7978	0.7144	0.5875	0.4567	0.3332	0.2478	0.2799	0.4422	0.6632	0.8051	0.8644 (86)
Living	18.4090	18.8822	19.5152	20.1931	20.6287	20.8673	20.9496	20.9331	20.7455	20.1109	19.1605	18.3357
Non living	16.9461	17.5236	18.2875	19.0892	19.5774	19.8360	19.9098	19.9011	19.7224	19.0257	17.8874	16.8612
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	19.6745	18.8822	19.5152	20.1931	20.6287	20.8673	20.9496	20.9331	20.7455	20.1109	19.1605	18.7084 (87)
Th 2	19.9024	19.9051	19.9079	19.9219	19.9248	19.9388	19.9388	19.9416	19.9332	19.9248	19.9191	19.9135 (88)
util rest of house	0.8380	0.7783	0.6885	0.5538	0.4153	0.2840	0.1913	0.2200	0.3869	0.6248	0.7830	0.8502 (89)
MIT 2	18.7183	17.5236	18.2875	19.0892	19.5774	19.8360	19.9098	19.9011	19.7224	19.0257	17.8874	17.4094 (90)
Living area fraction									fLA = Living area / (4) =			0.5899 (91)
MIT	19.2823	18.3250	19.0117	19.7404	20.1975	20.4443	20.5232	20.5099	20.3259	19.6658	18.6384	18.1757 (92)
Temperature adjustment												0.0000
adjusted MIT	19.2823	18.3250	19.0117	19.7404	20.1975	20.4443	20.5232	20.5099	20.3259	19.6658	18.6384	18.1757 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8284	0.7454	0.6649	0.5478	0.4261	0.3078	0.2228	0.2526	0.4079	0.6147	0.7521	0.8227 (94)
Useful gains	360.8879	392.7372	416.6848	408.7573	351.8074	254.5831	176.3517	182.4400	258.8005	318.0117	330.3288	340.2214 (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	723.2490	646.2098	600.5158	512.7939	400.7895	271.6040	182.3206	190.4289	291.0609	427.5937	547.4100	666.9105 (97)
Space heating kWh	269.5967	170.3336	136.7703	74.9064	36.4426	0.0000	0.0000	0.0000	0.0000	81.5290	156.2985	243.0567 (98a)
Space heating requirement - total per year (kWh/year)												1168.9338
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	269.5967	170.3336	136.7703	74.9064	36.4426	0.0000	0.0000	0.0000	0.0000	81.5290	156.2985	243.0567 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1168.9338
Space heating per m2										(98c) / (4) =		29.5933 (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 %)

203.1249 (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	269.5967	170.3336	136.7703	74.9064	36.4426	0.0000	0.0000	0.0000	0.0000	81.5290	156.2985	243.0567 (98)
Space heating efficiency (main heating system 1)	203.1249	203.1249	203.1249	203.1249	203.1249	0.0000	0.0000	0.0000	0.0000	203.1249	203.1249	203.1249 (210)
Space heating fuel (main heating system)	132.7246	83.8566	67.3331	36.8770	17.9410	0.0000	0.0000	0.0000	0.0000	40.1374	76.9470	119.6587 (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	202.9242	179.7055	191.3209	168.9446	164.3200	148.6448	147.0140	152.4534	153.7073	170.7263	180.7529	200.7831 (64)
Efficiency of water heater (217)m	316.8982	316.8982	316.8982	316.8982	316.8982	316.8982	316.8982	316.8982	316.8982	316.8982	316.8982	316.8982 (216)
Fuel for water heating, kWh/month	64.0345	56.7077	60.3730	53.3119	51.8526	46.9062	46.3916	48.1080	48.5037	53.8742	57.0382	63.3589 (219)
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	6.9067	6.2383	6.9067	6.6839	6.9067	6.6839	6.9067	6.9067	6.6839	6.9067	6.6839	6.9067 (231)
Lighting	12.1186	9.7220	8.7536	6.4133	4.9538	4.0473	4.5190	5.8740	7.6297	10.0106	11.3069	12.4554 (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												575.4755 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												316.8982
Water heating fuel used												650.4603 (219)
Space cooling fuel												0.0000 (221)

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Electricity for pumps and fans:

(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.6750)	
mechanical ventilation fans (SFP = 0.6750)	81.3206 (230a)
Total electricity for the above, kWh/year	81.3206 (231)
Electricity for lighting (calculated in Appendix L)	97.8042 (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	1405.0606 (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	575.4755	0.1557	89.5768 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	650.4603	0.1408	91.5670 (264)
Space and water heating			181.1438 (265)
Pumps, fans and electric keep-hot	81.3206	0.1387	11.2802 (267)
Energy for lighting	97.8042	0.1443	14.1162 (268)
Total CO2, kg/year			206.5401 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			5.2300 (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	575.4755	1.5762	907.0695 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	650.4603	1.5205	989.0377 (278)
Space and water heating			1896.1072 (279)
Pumps, fans and electric keep-hot	81.3206	1.5128	123.0218 (281)
Energy for lighting	97.8042	1.5338	150.0154 (282)
Total Primary energy kWh/year			2169.1444 (286)
Dwelling Primary energy Rate (DPER)			54.9200 (287)

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

1. Overall dwelling characteristics

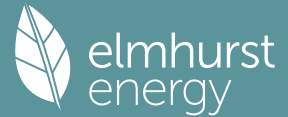
	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	39.5000	2.5000	98.7500
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	39.5000		98.7500
Dwelling volume			98.7500

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) = 0.2025 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4525 (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) = 0.3847 (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	0.4904	0.4808	0.4712	0.4231	0.4135	0.3654	0.3654	0.3558	0.3847	0.4135	0.4327	0.4520 (22b)
Effective ac	0.6203	0.6156	0.6110	0.5895	0.5855	0.5668	0.5668	0.5633	0.5740	0.5855	0.5936	0.6021 (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			7.7800	1.1450	8.9084			(27)					
top floor exposed new	33.5000	7.7800	25.7200	0.1800	4.6296			(29a)					
corridor new	26.2500	2.1000	24.1500	0.1800	4.3470			(29a)					
flat roof new	21.9000		21.9000	0.1100	2.4090			(30)					
roof terrace new	17.6000		17.6000	0.1100	1.9360			(30)					
Total net area of external elements Aum(A, m2)			99.2500					(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	24.3300			(33)					
Main dwelling													
pw			10.7500	0.0000	0.0000			(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							73.5089	(35)					
List of Thermal Bridges													
K1 Element				Length	Psi-value		Total						
E2 Other lintels (including other steel lintels)				6.2000	0.0500		0.3100						
E3 Sill				5.2000	0.0500		0.2600						
E4 Jamb				14.2000	0.0500		0.7100						
E15 Flat roof with parapet				13.6000	0.5600		7.6160						
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)				13.6000	0.2400		3.2640						
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							12.6850	(36)					
Point Thermal Bridges						(36a) =	0.0000						
Total fabric heat loss						(33) + (36) + (36a) =	37.0150	(37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 20.2128	Feb 20.0606	Mar 19.9114	Apr 19.2108	May 19.0797	Jun 18.4695	Jul 18.4695	Aug 18.3565	Sep 18.7045	Oct 19.0797	Nov 19.3449	Dec 19.6221	(38)
Heat transfer coeff	57.2278	57.0756	56.9264	56.2258	56.0947	55.4845	55.4845	55.3715	55.7195	56.0947	56.3599	56.6371	(39)
Average = Sum(39)m / 12 =												56.2252	
HLP	Jan 1.4488	Feb 1.4450	Mar 1.4412	Apr 1.4234	May 1.4201	Jun 1.4047	Jul 1.4047	Aug 1.4018	Sep 1.4106	Oct 1.4201	Nov 1.4268	Dec 1.4339	(40)
HLP (average)												1.4234	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

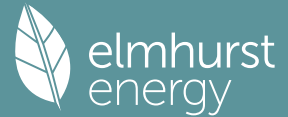
4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.3931	(42)
Hot water usage for mixer showers														
	47.5773	46.8623	45.8204	43.8269	42.3558	40.7152	39.7827	40.8167	41.9502	43.7117	45.7480	47.3950	42a	
Hot water usage for baths														
	20.5830	20.2773	19.8469	19.0532	18.4588	17.7998	17.4439	17.8713	18.3367	19.0419	19.8520	20.5134	42b	
Hot water usage for other uses														
	28.8968	27.8461	26.7953	25.7445	24.6937	23.6429	23.6429	24.6937	25.7445	26.7953	27.8461	28.8968	42c	
Average daily hot water use (litres/day)													89.2182	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
	97.0572	94.9857	92.4625	88.6246	85.5083	82.1579	80.8695	83.3817	86.0314	89.5488	93.4460	96.8053	44	
Energy conte	153.7148	135.2583	142.1115	121.3226	115.1106	101.0228	97.8046	103.2440	106.0853	121.5169	133.1309	151.5737	45	
Energy content (annual)													1481.8960	
Distribution loss (46)m = 0.15 x (45)m														
	23.0572	20.2888	21.3167	18.1984	17.2666	15.1534	14.6707	15.4866	15.9128	18.2275	19.9696	22.7361	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														
	200.3097	177.3441	188.7064	166.4144	161.7055	146.1146	144.3995	149.8389	151.1772	168.1118	178.2228	198.1686	62	
WWHRS	-21.7503	-19.2362	-20.1430	-16.6792	-15.5444	-13.3015	-12.4680	-13.2585	-13.7622	-16.2241	-18.3800	-21.3476	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	178.5594	158.1079	168.5633	149.7352	146.1611	132.8131	131.9315	136.5804	137.4149	151.8877	159.8428	176.8210	64	
Total per year (kWh/year)													1828.4183	64
Electric shower(s)													1828	64
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	64a	
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =													0.0000	64a
Heat gains from water heating, kWh/month														
	88.3861	78.6420	84.5280	76.4132	75.5502	69.6635	69.7960	71.6045	71.3468	77.6803	80.3395	87.6742	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	69.6555	69.6555	69.6555	69.6555	69.6555	69.6555	69.6555	69.6555	69.6555	69.6555	69.6555	69.6555	66	
	61.1959	67.7526	61.1959	63.2358	61.1959	63.2358	61.1959	61.1959	63.2358	61.1959	63.2358	61.1959	67	
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	120.2780	121.5261	118.3809	111.6852	103.2330	95.2891	89.9821	88.7340	91.8792	98.5750	107.0272	114.9710	68	
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	29.9656	29.9656	29.9656	29.9656	29.9656	29.9656	29.9656	29.9656	29.9656	29.9656	29.9656	29.9656	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)														
	-55.7244	-55.7244	-55.7244	-55.7244	-55.7244	-55.7244	-55.7244	-55.7244	-55.7244	-55.7244	-55.7244	-55.7244	71	
Water heating gains (Table 5)														
	118.7985	117.0267	113.6129	106.1295	101.5460	96.7549	93.8118	96.2427	99.0928	104.4090	111.5826	117.8416	72	
Total internal gains														
	347.1691	353.2021	340.0864	327.9471	312.8715	299.1765	288.8865	290.0693	298.1045	311.0766	328.7422	340.9052	73	

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6. Solar gains

[Jan]			Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	g	Specific data or Table 6c	FF	Access factor Table 6d	Gains W
East			7.7800	19.6403	0.6300		0.7000		0.7700	46.6980 (76)
Solar gains	46.6980	91.3513	150.4426	219.4115	268.8970	275.2640	262.0625	225.1078	174.9709	108.3960
Total gains	393.8671	444.5534	490.5289	547.3586	581.7686	574.4405	550.9490	515.1771	473.0754	419.4726

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	14.0938	14.1314	14.1684	14.3449	14.3785	14.5366	14.5366	14.5663	14.4753	14.3785	14.3108	14.2408	
alpha	1.9396	1.9421	1.9446	1.9563	1.9586	1.9691	1.9691	1.9711	1.9650	1.9586	1.9541	1.9494	
util living area	0.8863	0.8571	0.8119	0.7307	0.6254	0.4977	0.3886	0.4233	0.5922	0.7637	0.8543	0.8928 (86)	
MIT	17.6897	18.0605	18.6620	19.4548	20.1289	20.6160	20.8332	20.7963	20.4223	19.5485	18.5080	17.6362 (87)	
Th 2	19.7261	19.7290	19.7319	19.7454	19.7479	19.7598	19.7598	19.7619	19.7552	19.7479	19.7428	19.7375 (88)	
util rest of house	0.8723	0.8400	0.7888	0.6968	0.5756	0.4257	0.2947	0.3287	0.5231	0.7262	0.8341	0.8796 (89)	
MIT 2	16.0057	16.4603	17.1960	18.1521	18.9334	19.4663	19.6685	19.6436	19.2808	18.2910	17.0276	15.9433 (90)	
Living area fraction									FLA = Living area / (4) =				0.5899 (91)
MIT	16.9990	17.4042	18.0608	18.9206	19.6386	20.1445	20.3555	20.3236	19.9542	19.0328	17.9008	16.9419 (92)	
Temperature adjustment												0.0000	
adjusted MIT	16.9990	17.4042	18.0608	18.9206	19.6386	20.1445	20.3555	20.3236	19.9542	19.0328	17.9008	16.9419 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8328	0.7999	0.7517	0.6713	0.5708	0.4493	0.3415	0.3735	0.5351	0.7009	0.7962	0.8407 (94)
Useful gains	327.9987	355.6052	368.7312	367.4215	332.0886	258.0995	188.1467	192.4383	253.1553	294.0166	308.1203	318.8888 (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	726.7374	713.6847	658.1144	563.4137	445.3121	307.6327	208.3722	217.2542	326.1923	473.0340	608.7336	721.6645 (97)
Space heating kWh	296.6615	240.6294	215.3012	141.1144	84.2383	0.0000	0.0000	0.0000	0.0000	133.1890	216.4415	299.6651 (98a)
Space heating requirement - total per year (kWh/year)												1627.2404
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	296.6615	240.6294	215.3012	141.1144	84.2383	0.0000	0.0000	0.0000	0.0000	133.1890	216.4415	299.6651 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1627.2404
Space heating per m2										(98c) / (4) =		41.1960 (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	296.6615	240.6294	215.3012	141.1144	84.2383	0.0000	0.0000	0.0000	0.0000	133.1890	216.4415	299.6651 (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)	321.4101	260.7036	233.2624	152.8867	91.2657	0.0000	0.0000	0.0000	0.0000	144.3001	234.4979	324.6642 (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	178.5594	158.1079	168.5633	149.7352	146.1611	132.8131	131.9315	136.5804	137.4149	151.8877	159.8428	176.8210 (64)
Efficiency of water heater	85.1899	84.9988	84.6097	83.9270	82.8709	79.8000	79.8000	79.8000	79.8000	83.7665	84.7402	79.8000 (216)
(217)m	85.1899	84.9988	84.6097	83.9270	82.8709	79.8000	79.8000	79.8000	79.8000	83.7665	84.7402	85.2328 (217)
Fuel for water heating, kWh/month	209.6015	186.0119	199.2246	178.4113	176.3721	166.4325	165.3277	171.1534	172.1992	181.3227	188.6269	207.4566 (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	12.7153	10.2007	9.1846	6.7290	5.1977	4.2466	4.7415	6.1632	8.0054	10.5035	11.8637	13.0687 (232)
Electricity generated by PVs (Appendix M) (negative quantity)							-58.8763	-56.8387	-52.8253	-47.2861	-34.3006	-27.8893 (233a)
(233a)m	-31.9145	-42.6499	-58.2161	-62.1572	-64.5147	-59.4939	-58.8763	-56.8387	-52.8253	-47.2861	-34.3006	-27.8893 (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	-25.9213	-53.3764	-103.9864	-153.1980	-199.7144	-199.5207	-197.0398	-167.9866	-124.7898	-75.1116	-34.2065	-20.5724 (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)												

Full SAP Calculation Printout



(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												1762.9907	(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												2202.1402	(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)												102.6198	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1952.3865	(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												2201.3642	(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	1762.9907	0.2100	370.2280	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2202.1402	0.2100	462.4494	(264)
Space and water heating			832.6775	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	102.6198	0.1443	14.8112	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-596.9625	0.1357	-80.9789	
PV Unit electricity exported	-1355.4239	0.1265	-171.4477	
Total			-252.4266	(269)
Total CO2, kg/year			606.9913	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			15.3700	(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	1762.9907	1.1300	1992.1794	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2202.1402	1.1300	2488.4184	(278)
Space and water heating			4480.5979	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	102.6198	1.5338	157.4016	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-596.9625	1.5014	-896.2812	
PV Unit electricity exported	-1355.4239	0.4643	-629.3690	
Total			-1525.6502	(283)
Total Primary energy kWh/year			3242.4501	(286)
Target Primary Energy Rate (TPER)			82.0900	(287)