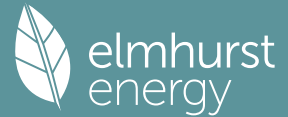


Full SAP Calculation Printout



Property Reference	UNIT 39				Issued on Date	02/07/2025	
Assessment Reference	UNIT 39			Prop Type Ref			
Property	Flat 40, Alexander House, 205 Kings Road, READING, RG1 4FW						
SAP Rating	86 B	DER	4.63	TER	13.02		
Environmental	97 A	% DER < TER				64.44	
CO ₂ Emissions (t/year)	0.17	DFEE	35.81	TFEE	38.75		
Compliance Check	See BREL	% DFEE < TFEE				7.59	
% DPER < TPER	29.67	DPER	48.89	TPER	69.51		
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	39.3000 (1b)	2.5000 (2b)	98.2500 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	39.3000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	98.2500 (5)

2. Ventilation rate

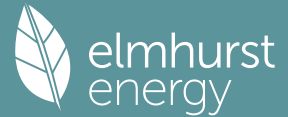
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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	3.9200 (17)
Infiltration rate	0.1960 (18)
Number of sides sheltered	3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1519 (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	0.1937	0.1899	0.1861	0.1671	0.1633	0.1443	0.1443	0.1405	0.1519	0.1633	0.1709	0.1785 (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	0.2977	0.2939	0.2901	0.2711	0.2673	0.2483	0.2483	0.2445	0.2559	0.2673	0.2749	0.2825 (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			3.3800	1.1450	3.8702		(27)
2			3.3800	1.1450	3.8702		(27)
1			2.1000	1.0000	2.1000		(26)
top floor exposed new	20.2500	6.7600	13.4900	0.2000	2.6980	18.0000	242.8200 (29a)
corridor new	14.5000	2.1000	12.4000	0.2300	2.8520	14.0000	173.6000 (29a)
flat roof new	16.9000		16.9000	0.1300	2.1970	9.0000	152.1000 (30)
roof terrace new	22.4000		22.4000	0.1300	2.9120	9.0000	201.6000 (30)
Total net area of external elements A _{um} (A _m , m ²)			74.0500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	20.4995		(33)
Main dwelling							
pw			27.2500	0.0000	0.0000	20.0000	545.0000 (32)
pf			39.3000			30.0000	1179.0000 (32d)
iw			56.5000			9.0000	508.5000 (32c)
Heat capacity C _m = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	3002.6200 (34)

Full SAP Calculation Printout



Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K												76.4025 (35)	
List of Thermal Bridges													
K1 Element								Length	Psi-value	Total			
E2 Other lintels (including other steel lintels)								3.7000	0.0470	0.1739			
E3 Sill								2.7000	0.0150	0.0405			
E4 Jamb								14.2000	0.0470	0.6674			
E15 Flat roof with parapet								8.0000	0.1970	1.5760			
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)								8.0000	0.0500	0.4000			
Thermal bridges (Sum(L x Psi) calculated using Appendix K)											4.5078 (36)		
Point Thermal bridges											(36a) = 0.0000		
Total fabric heat loss											(33) + (36) + (36a) = 25.0073 (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	
	9.6513	9.5282	9.4050	8.7894	8.6663	8.0507	8.0507	7.9275	8.2969	8.6663	8.9125	9.1588 (38)	
Heat transfer coeff													
	34.6585	34.5354	34.4123	33.7967	33.6735	33.0579	33.0579	32.9348	33.3042	33.6735	33.9198	34.1660 (39)	
Average = Sum(39)m / 12 =											33.7659		
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	0.8819	0.8788	0.8756	0.8600	0.8568	0.8412	0.8412	0.8380	0.8474	0.8568	0.8631	0.8694 (40)	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

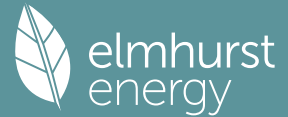
4. Water heating energy requirements (kWh/year)													
Assumed occupancy													1.3879 (42)
Hot water usage for mixer showers													
	47.4892	46.7755	45.7356	43.7458	42.2774	40.6399	39.7091	40.7412	41.8725	43.6307	45.6633	47.3073 (42a)	
Hot water usage for baths													
	20.5451	20.2400	19.8103	19.0181	18.4249	17.7671	17.4118	17.8384	18.3030	19.0069	19.8154	20.4757 (42b)	
Hot water usage for other uses													
	28.8430	27.7942	26.7454	25.6965	24.6477	23.5989	23.5989	24.6477	25.6965	26.7454	27.7942	28.8430 (42c)	
Average daily hot water use (litres/day)													89.0530 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	96.8774	94.8098	92.2913	88.4604	85.3500	82.0058	80.7197	83.2273	85.8721	89.3830	93.2729	96.6260 (44)	
Energy conte	153.4301	135.0078	141.8483	121.0979	114.8975	100.8357	97.6235	103.0528	105.8888	121.2919	132.8843	151.2930 (45)	
Energy content (annual)												Total = Sum(45)m = 1479.1515	
Distribution loss (46)m = 0.15 x (45)m	23.0145	20.2512	21.2772	18.1647	17.2346	15.1254	14.6435	15.4579	15.8833	18.1938	19.9327	22.6939 (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													
	202.6395	179.4550	191.0577	168.7199	164.1069	148.4577	146.8329	152.2622	153.5108	170.5013	180.5063	200.5024 (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													
	202.6395	179.4550	191.0577	168.7199	164.1069	148.4577	146.8329	152.2622	153.5108	170.5013	180.5063	200.5024 (64)	
											Total per year (kWh/year) = Sum(64)m = 2058.5525 (64)	2059 (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													
	90.3830	80.4479	86.5321	78.3627	77.5709	71.6255	71.8273	73.6326	73.3056	79.6971	82.2816	89.6724 (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	
	69.3929	69.3929	69.3929	69.3929	69.3929	69.3929	69.3929	69.3929	69.3929	69.3929	69.3929	69.3929 (66)	
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	60.9545	67.4853	60.9545	62.9863	60.9545	62.9863	60.9545	60.9545	62.9863	60.9545	62.9863	60.9545 (67)	
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	119.7770	121.0199	117.8878	111.2200	102.8030	94.8922	89.6074	88.3644	91.4965	98.1644	106.5814	114.4921 (68)	
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	29.9393	29.9393	29.9393	29.9393	29.9393	29.9393	29.9393	29.9393	29.9393	29.9393	29.9393	29.9393 (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)													
	-55.5143	-55.5143	-55.5143	-55.5143	-55.5143	-55.5143	-55.5143	-55.5143	-55.5143	-55.5143	-55.5143	-55.5143 (71)	
Water heating gains (Table 5)													
	121.4826	119.7141	116.3065	108.8370	104.2620	99.4798	96.5421	98.9685	101.8134	107.1197	114.2801	120.5275 (72)	
Total internal gains	346.0319	352.0372	338.9667	326.8611	311.8373	301.1762	290.9218	292.1053	300.1141	310.0564	327.6656	339.7919 (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								
West	3.3800	19.6403	0.6300	0.8000	0.7700	23.1861 (80)							
West	3.3800	19.6403	0.6300	0.8000	0.7700	23.1861 (80)							

Solar gains	46.3722	90.7139	149.3928	217.8805	267.0208	273.3433	260.2340	223.5371	173.7500	107.6397	57.8207	38.1342 (83)	

Full SAP Calculation Printout



Total gains 392.4041 442.7510 488.3595 544.7417 578.8581 574.5195 551.1557 515.6424 473.8641 417.6961 385.4863 377.9262 (84)

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	24.0651	24.1509	24.2373	24.6788	24.7690	25.2303	25.2303	25.3246	25.0437	24.7690	24.5892	24.4120	21.0000 (85)
alpha	2.6043	2.6101	2.6158	2.6453	2.6513	2.6820	2.6820	2.6883	2.6696	2.6513	2.6393	2.6275	
util living area	0.8447	0.7995	0.7312	0.6155	0.4865	0.3519	0.2584	0.2860	0.4460	0.6595	0.7936	0.8540	(86)
Living	19.3227	19.6279	20.0350	20.4956	20.7836	20.9350	20.9791	20.9722	20.8730	20.4874	19.8677	19.2866	
Non living	18.2312	18.6071	19.1046	19.6613	19.9909	20.1630	20.2040	20.2013	20.0998	19.6672	18.9198	18.1940	
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	20.1420	19.6279	20.0350	20.4956	20.7836	20.9350	20.9791	20.9722	20.8730	20.4874	19.8677	19.5262	(87)
Th 2	20.1829	20.1856	20.1883	20.2017	20.2043	20.2178	20.2178	20.2205	20.2124	20.2043	20.1990	20.1936	(88)
util rest of house	0.8313	0.7832	0.7103	0.5883	0.4528	0.3125	0.2142	0.2398	0.4027	0.6282	0.7745	0.8413	(89)
MIT 2	19.4048	18.6071	19.1046	19.6613	19.9909	20.1630	20.2040	20.2013	20.0998	19.6672	18.9198	18.5543	(90)
Living area fraction									fLA = Living area / (4) =			0.5802	(91)
MIT	19.8325	19.1993	19.6443	20.1453	20.4508	20.6109	20.6536	20.6486	20.5483	20.1430	19.4697	19.1182	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8325	19.1993	19.6443	20.1453	20.4508	20.6109	20.6536	20.6486	20.5483	20.1430	19.4697	19.1182	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8250	0.7612	0.6952	0.5863	0.4635	0.3325	0.2390	0.2654	0.4215	0.6256	0.7552	0.8221	(94)
Useful gains	323.7524	337.0285	339.4964	319.3879	268.2771	191.0160	131.7071	136.8409	199.7358	261.3215	291.1161	310.6805	(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	538.3335	493.8330	452.3267	380.0542	294.6704	198.7078	134.0051	139.9252	214.7565	321.3476	419.5786	509.6953	(97)
Space heating kWh	159.6483	105.3727	83.9457	43.6797	19.6366	0.0000	0.0000	0.0000	0.0000	44.6594	92.4930	148.0670	(98a)
Space heating requirement - total per year (kWh/year)												697.5025	
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	159.6483	105.3727	83.9457	43.6797	19.6366	0.0000	0.0000	0.0000	0.0000	44.6594	92.4930	148.0670	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												697.5025	
Space heating per m2										(98c) / (4) =		17.7482	(99)

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

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

Fraction of space heat from main system(s)	0.0000	(201)
Efficiency of main space heating system 1 (in %)	1.0000	(202)
Efficiency of main space heating system 2 (in %)	170.2915	(206)
Efficiency of secondary/supplementary heating system, %	0.0000	(207)
	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	159.6483	105.3727	83.9457	43.6797	19.6366	0.0000	0.0000	0.0000	0.0000	44.6594	92.4930	148.0670	(98)
Space heating efficiency (main heating system 1)	170.2915	170.2915	170.2915	170.2915	170.2915	0.0000	0.0000	0.0000	0.0000	170.2915	170.2915	170.2915	(210)
Space heating fuel (main heating system)	93.7500	61.8778	49.2953	25.6500	11.5312	0.0000	0.0000	0.0000	0.0000	26.2253	54.3145	86.9491	(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	202.6395	179.4550	191.0577	168.7199	164.1069	148.4577	146.8329	152.2622	153.5108	170.5013	180.5063	200.5024	(64)
Efficiency of water heater (217)m	312.3173	312.3173	312.3173	312.3173	312.3173	312.3173	312.3173	312.3173	312.3173	312.3173	312.3173	312.3173	(216)
Fuel for water heating, kWh/month	64.8826	57.4592	61.1742	54.0220	52.5449	47.5342	47.0140	48.7524	49.1522	54.5923	57.7958	64.1983	(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	6.8717	6.2067	6.8717	6.6500	6.8717	6.6500	6.8717	6.8717	6.6500	6.8717	6.6500	6.8717	(231)
Lighting	12.1762	9.7682	8.7952	6.4437	4.9773	4.0665	4.5405	5.9019	7.6659	10.0581	11.3606	12.5146	(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												409.5931	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												312.3173	
Water heating fuel used												659.1222	(219)
Space cooling fuel												0.0000	(221)

Full SAP Calculation Printout



Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.6750)	
mechanical ventilation fans (SFP = 0.6750)	80.9089 (230a)
Total electricity for the above, kWh/year	80.9089 (231)
Electricity for lighting (calculated in Appendix L)	98.2686 (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	1247.8927 (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	409.5931	0.1559	63.8548 (261)
Total CO2 associated with community systems			0.0000 (261)
Water heating (other fuel)	659.1222	0.1408	92.7856 (264)
Space and water heating			156.6404 (265)
Pumps, fans and electric keep-hot	80.9089	0.1387	11.2231 (267)
Energy for lighting	98.2686	0.1443	14.1832 (268)
Total CO2, kg/year			182.0466 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.6300 (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	409.5931	1.5771	645.9763 (275)
Total CO2 associated with community systems			0.0000 (275)
Water heating (other fuel)	659.1222	1.5205	1002.2055 (278)
Space and water heating			1648.1819 (279)
Pumps, fans and electric keep-hot	80.9089	1.5128	122.3989 (281)
Energy for lighting	98.2686	1.5338	150.7276 (282)
Total Primary energy kWh/year			1921.3084 (286)
Dwelling Primary energy Rate (DPER)			48.8900 (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	39.3000	2.5000	98.2500
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	39.3000		98.2500
Dwelling volume			98.2500

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) = 0.2036 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4536 (18)
Number of sides sheltered	3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3515 (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	0.4482	0.4394	0.4306	0.3867	0.3779	0.3339	0.3339	0.3251	0.3515	0.3779	0.3954	0.4130 (22b)
Effective ac	0.6004	0.5965	0.5927	0.5748	0.5714	0.5558	0.5558	0.5529	0.5618	0.5714	0.5782	0.5853 (25)

Full SAP Calculation Printout



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			6.7600	1.1450	7.7405			(27)					
top floor exposed new	20.2500	6.7600	13.4900	0.1800	2.4282			(29a)					
corridor new	14.5000	2.1000	12.4000	0.1800	2.2320			(29a)					
flat roof new	16.9000		16.9000	0.1100	1.8590			(30)					
roof terrace new	22.4000		22.4000	0.1100	2.4640			(30)					
Total net area of external elements Aum(A, m2)			74.0500					(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)... (30) + (32) =	18.8237			(33)					
Main dwelling													
pw			27.2500	0.0000	0.0000			(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							76.4025	(35)					
List of Thermal Bridges													
K1 Element				Length	Psi-value		Total						
E2 Other lintels (including other steel lintels)				3.7000	0.0500		0.1850						
E3 Sill				2.7000	0.0500		0.1350						
E4 Jamb				14.2000	0.0500		0.7100						
E15 Flat roof with parapet				8.0000	0.5600		4.4800						
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)				8.0000	0.2400		1.9200						
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.9550	(36)					
Point Thermal bridges						(36a) =	0.0000						
Total fabric heat loss						(33) + (36) + (36a) =	26.7787	(37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 19.4675	Feb 19.3410	Mar 19.2171	Apr 18.6350	May 18.5260	Jun 18.0190	Jul 18.0190	Aug 17.9251	Sep 18.2143	Oct 18.5260	Nov 18.7464	Dec 18.9767	(38)
Heat transfer coeff	46.2461	46.1197	45.9957	45.4136	45.3047	44.7977	44.7977	44.7038	44.9930	45.3047	45.5250	45.7554	(39)
Average = Sum(39)m / 12 =												45.4131	
HLP	Jan 1.1767	Feb 1.1735	Mar 1.1704	Apr 1.1556	May 1.1528	Jun 1.1399	Jul 1.1399	Aug 1.1375	Sep 1.1449	Oct 1.1528	Nov 1.1584	Dec 1.1643	(40)
HLP (average)												1.1555	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

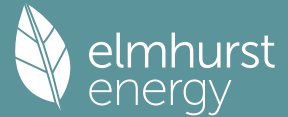
4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.3879	(42)
Hot water usage for mixer showers	47.4892	46.7755	45.7356	43.7458	42.2774	40.6399	39.7091	40.7412	41.8725	43.6307	45.6633	47.3073	42a)	
Hot water usage for baths	20.5451	20.2400	19.8103	19.0181	18.4249	17.7671	17.4118	17.8384	18.3030	19.0069	19.8154	20.4757	42b)	
Hot water usage for other uses	28.8430	27.7942	26.7454	25.6965	24.6477	23.5989	23.5989	24.6477	25.6965	26.7454	27.7942	28.8430	42c)	
Average daily hot water use (litres/day)													89.0530	43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Energy content (annual)	96.8774	94.8098	92.2913	88.4604	85.3500	82.0058	80.7197	83.2273	85.8721	89.3830	93.2729	96.6260	44)	
Distribution loss (46)m = 0.15 x (45)m	153.4301	135.0078	141.8483	121.0979	114.8975	100.8357	97.6235	103.0528	105.8888	121.2919	132.8843	151.2930	45)	
Total = Sum(45)m =	23.0145	20.2512	21.2772	18.1647	17.2346	15.1254	14.6435	15.4579	15.8833	18.1938	19.9327	22.6939	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	200.0250	177.0936	188.4432	166.1897	161.4924	145.9275	144.2184	149.6477	150.9807	167.8868	177.9762	197.8879	62)	
WWHRS	-21.7101	-19.2006	-20.1057	-16.6483	-15.5157	-13.2769	-12.4449	-13.2339	-13.7367	-16.1941	-18.3460	-21.3080	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	178.3149	157.8930	168.3374	149.5414	145.9767	132.6507	131.7734	136.4137	137.2439	151.6927	159.6302	176.5798	64)	
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		1826.0479	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	88.2914	78.5587	84.4405	76.3385	75.4793	69.6013	69.7357	71.5410	71.2815	77.6055	80.2575	87.5808	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	69.3929	69.3929	69.3929	69.3929	69.3929	69.3929	69.3929	69.3929	69.3929	69.3929	69.3929	69.3929	(66)
	62.1779	68.8398	62.1779	64.2505	62.1779	64.2505	62.1779	62.1779	64.2505	62.1779	64.2505	62.1779	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	119.7770	121.0199	117.8878	111.2200	102.8030	94.8922	89.6074	88.3644	91.4965	98.1644	106.5814	114.4921	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	29.9393	29.9393	29.9393	29.9393	29.9393	29.9393	29.9393	29.9393	29.9393	29.9393	29.9393	29.9393	(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)													
	-55.5143	-55.5143	-55.5143	-55.5143	-55.5143	-55.5143	-55.5143	-55.5143	-55.5143	-55.5143	-55.5143	-55.5143	(71)
Water heating gains (Table 5)													
	118.6713	116.9028	113.4953	106.0257	101.4507	96.6685	93.7308	96.1572	99.0021	104.3084	111.4688	117.7162	(72)
Total internal gains													
	347.4441	353.5804	340.3789	328.3141	313.2495	299.6291	289.3339	290.5174	298.5670	311.4686	329.1185	341.2041	(73)

Full SAP Calculation Printout



6. Solar gains

[Jan]	Area m ²		Solar flux Table 6a W/m ²		Specific data or Table 6b		Specific data or Table 6c		Access factor Table 6d		Gains W	
West	6.7600		19.6403		0.6300		0.7000		0.7700		40.5757 (80)	
Solar gains	40.5757	79.3746	130.7187	190.6455	233.6432	239.1754	227.7047	195.5950	152.0313	94.1847	50.5931	33.3675 (83)
Total gains	388.0198	432.9551	471.0976	518.9595	546.8927	538.8045	517.0386	486.1124	450.5983	405.6533	379.7116	374.5715 (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	18.0353	18.0847	18.1334	18.3659	18.4100	18.6184	18.6184	18.6575	18.5376	18.4100	18.3209	18.2287
alpha	2.2024	2.2056	2.2089	2.2244	2.2273	2.2412	2.2412	2.2438	2.2358	2.2273	2.2214	2.2152
util living area	0.8772	0.8458	0.7973	0.7093	0.5965	0.4626	0.3528	0.3853	0.5560	0.7400	0.8406	0.8842 (86)
MIT	18.4158	18.7456	19.2527	19.9056	20.4256	20.7725	20.9108	20.8885	20.6368	19.9672	19.1100	18.3696 (87)
Th 2	19.9386	19.9412	19.9438	19.9557	19.9580	19.9684	19.9684	19.9703	19.9644	19.9580	19.9534	19.9487 (88)
util rest of house	0.8638	0.8295	0.7757	0.6784	0.5527	0.4026	0.2785	0.3097	0.4965	0.7052	0.8213	0.8716 (89)
MIT 2	16.9647	17.3736	18.0001	18.7955	19.4018	19.7850	19.9148	19.8998	19.6524	18.8904	17.8424	16.9122 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	17.8066	18.1695	18.7268	19.4395	19.9958	20.3579	20.4926	20.4734	20.2235	19.5151	18.5778	17.7577 (92)
Temperature adjustment	0.0000											
adjusted MIT	17.8066	18.1695	18.7268	19.4395	19.9958	20.3579	20.4926	20.4734	20.2235	19.5151	18.5778	17.7577 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8303	0.7966	0.7468	0.6615	0.5544	0.4260	0.3171	0.3476	0.5121	0.6886	0.7907	0.8385 (94)
Useful gains	322.1759	344.8723	351.8252	343.3123	303.2140	229.5324	163.9583	168.9758	230.7676	279.3526	300.2288	314.0883 (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	624.6264	611.9872	562.3805	478.6379	375.8379	257.9397	174.3797	182.0966	275.5154	403.8975	522.5278	620.3384 (97)
Space heating kWh	225.0232	179.5012	156.6531	97.4345	54.0322	0.0000	0.0000	0.0000	0.0000	92.6614	160.0553	227.8501 (98a)
Space heating requirement - total per year (kWh/year)	1193.2110											
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	225.0232	179.5012	156.6531	97.4345	54.0322	0.0000	0.0000	0.0000	0.0000	92.6614	160.0553	227.8501 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	1193.2110											
Space heating per m ²	(98c) / (4) = 30.3616 (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	225.0232	179.5012	156.6531	97.4345	54.0322	0.0000	0.0000	0.0000	0.0000	92.6614	160.0553	227.8501 (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)	243.7955	194.4759	169.7217	105.5628	58.5398	0.0000	0.0000	0.0000	0.0000	100.3915	173.4077	246.8582 (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	178.3149	157.8930	168.3374	149.5414	145.9767	132.6507	131.7734	136.4137	137.2439	151.6927	159.6302	176.5798 (64)
Efficiency of water heater (217)m	84.5827	84.3482	83.8988	83.1236	82.0464	79.8000	79.8000	79.8000	79.8000	82.9896	84.0658	79.8000 (216)
Fuel for water heating, kWh/month	210.8174	187.1920	200.6435	179.9024	177.9196	166.2289	165.1296	170.9445	171.9849	182.7852	189.8873	208.6430 (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	12.9193	10.3644	9.3320	6.8370	5.2811	4.3147	4.8176	6.2621	8.1338	10.6720	12.0540	13.2784 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-31.7810	-42.4822	-57.9984	-61.9347	-64.2904	-59.2898	-58.6792	-56.6512	-52.6482	-47.1145	-34.1637	-27.7718 (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	-25.7620	-53.0579	-103.3828	-152.3300	-198.6009	-198.4133	-195.9411	-167.0358	-124.0676	-74.6635	-33.9965	-20.4446 (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												1292.7530	(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												2212.0784	(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)												104.2665	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1942.5009	(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												1752.5970	(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	1292.7530	0.2100	271.4781 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2212.0784	0.2100	464.5365 (264)
Space and water heating			736.0146 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	104.2665	0.1443	15.0489 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-594.8050	0.1356	-80.6835
PV Unit electricity exported	-1347.6959	0.1265	-170.4650
Total			-251.1485 (269)
Total CO2, kg/year			511.8442 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			13.0200 (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	1292.7530	1.1300	1460.8109 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2212.0784	1.1300	2499.6486 (278)
Space and water heating			3960.4595 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	104.2665	1.5338	159.9274 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-594.8050	1.5014	-893.0315
PV Unit electricity exported	-1347.6959	0.4643	-625.7615
Total			-1518.7930 (283)
Total Primary energy kWh/year			2731.6947 (286)
Target Primary Energy Rate (TPER)			69.5100 (287)