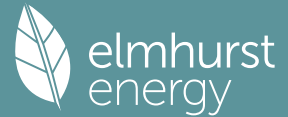


Full SAP Calculation Printout



Property Reference	UNIT 43				Issued on Date	02/07/2025	
Assessment Reference	UNIT 43			Prop Type Ref			
Property	Flat 44, Alexander House, 205 Kings Road, READING, RG1 4FW						
SAP Rating	85 B	DER	4.99	TER	14.14		
Environmental	97 A	% DER < TER				64.71	
CO ₂ Emissions (t/year)	0.19	DFEE	45.92	TFEE	46.14		
Compliance Check	See BREL	% DFEE < TFEE				0.48	
% DPER < TPER	30.53	DPER	52.45	TPER	75.50		
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	41.2000 (1b)	2.5000 (2b)	103.0000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	41.2000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	103.0000 (5)

2. Ventilation rate

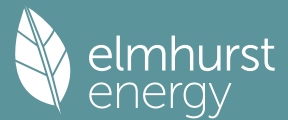
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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	3.9200 (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			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	28.5000	13.0000	15.5000	0.2000	3.1000	18.0000	279.0000 (29a)
corridor new	31.5000	2.1000	29.4000	0.2300	6.7620	14.0000	411.6000 (29a)
flat roof new	22.1000		22.1000	0.1300	2.8730	9.0000	198.9000 (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 , m ²)			99.7000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	32.0085		(33)
Main dwelling							
pw			10.7500	0.0000	0.0000	20.0000	215.0000 (32)
pf			39.7000			30.0000	1191.0000 (32d)
iw			56.5000			9.0000	508.5000 (32c)
Heat capacity C _m = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	2962.4000 (34)

Full SAP Calculation Printout



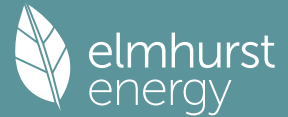
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K												71.9029 (35)
List of Thermal Bridges												
							Length	Psi-value	Total			
	K1 Element						6.2000	0.0470	0.2914			
	E2 Other lintels (including other steel lintels)						5.2000	0.0150	0.0780			
	E3 Sill						14.2000	0.0470	0.6674			
	E4 Jamb						11.6000	0.1970	2.2852			
	E15 Flat roof with parapet						2.5000	0.1800	0.4500			
	E16 Corner (normal)						2.5000	0.0000	0.0000			
	E17 Corner (inverted - internal area greater than external area)						5.0000	0.2400	1.2000			
	E18 Party wall between dwellings						11.6000	0.0500	0.5800			
Thermal bridges (Sum(L x Psi) calculated using Appendix K)												5.5520 (36)
Point Thermal Bridges												0.0000
Total fabric heat loss												(33) + (36) + (36a) = 37.5605 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	10.1179	9.9888	9.8597	9.2143	9.0853	8.4399	8.4399	8.3108	8.6980	9.0853	9.3434	9.6016 (38)
Average = Sum(39)m / 12 =	47.6784	47.5493	47.4202	46.7748	46.6458	46.0004	46.0004	45.8713	46.2585	46.6458	46.9039	47.1621 (39)
												46.7426
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1572	1.1541	1.1510	1.1353	1.1322	1.1165	1.1165	1.1134	1.1228	1.1322	1.1384	1.1447 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	1.1345
												31

4. Water heating energy requirements (kWh/year)												
Assumed occupancy												1.4386 (42)
Hot water usage for mixer showers												
	48.3397	47.6133	46.5547	44.5293	43.0346	41.3677	40.4203	41.4708	42.6224	44.4122	46.4811	48.1545 (42a)
Hot water usage for baths												
	20.9109	20.6003	20.1630	19.3567	18.7529	18.0834	17.7217	18.1560	18.6288	19.3452	20.1682	20.8402 (42b)
Hot water usage for other uses												
	29.3625	28.2948	27.2271	26.1593	25.0916	24.0239	24.0239	25.0916	26.1593	27.2271	28.2948	29.3625 (42c)
Average daily hot water use (litres/day)												90.6485 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	98.6132	96.5084	93.9448	90.0453	86.8791	83.4750	82.1659	84.7184	87.4106	90.9845	94.9441	98.3573 (44)
Energy content (annual)	156.1791	137.4267	144.3896	123.2675	116.9559	102.6422	99.3725	104.8991	107.7861	123.4651	135.2652	154.0037 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m =
	23.4269	20.6140	21.6584	18.4901	17.5434	15.3963	14.9059	15.7349	16.1679	18.5198	20.2898	1505.6528
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												
	205.3885	181.8739	193.5990	170.8895	166.1653	150.2642	148.5819	154.1085	155.4081	172.6745	182.8872	203.2131 (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												
	205.3885	181.8739	193.5990	170.8895	166.1653	150.2642	148.5819	154.1085	155.4081	172.6745	182.8872	203.2131 (64)
Total per year (kWh/year)												2085.0538 (64)
Electric shower(s)												2085 (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												
	91.2971	81.2521	87.3771	79.0840	78.2554	72.2261	72.4089	74.2465	73.9365	80.4197	83.0733	90.5737 (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	71.9292	71.9292	71.9292	71.9292	71.9292	71.9292	71.9292	71.9292	71.9292	71.9292	71.9292	71.9292 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	62.8277	69.5592	62.8277	64.9219	62.8277	64.9219	62.8277	62.8277	64.9219	62.8277	64.9219	62.8277 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	124.5629	125.8554	122.5982	115.6639	106.9106	98.6838	93.1877	91.8952	95.1524	102.0867	110.8400	119.0668 (68)
Pumps, fans	30.1929	30.1929	30.1929	30.1929	30.1929	30.1929	30.1929	30.1929	30.1929	30.1929	30.1929	30.1929 (69)
Losses e.g. evaporation (negative values) (Table 5)	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)
	-57.5433	-57.5433	-57.5433	-57.5433	-57.5433	-57.5433	-57.5433	-57.5433	-57.5433	-57.5433	-57.5433	-57.5433 (71)
Water heating gains (Table 5)												
	122.7111	120.9109	117.4423	109.8389	105.1819	100.3141	97.3238	99.7937	102.6895	108.0909	115.3796	121.7389 (72)
Total internal gains												
	354.6804	360.9043	347.4469	335.0035	319.4990	308.4985	297.9179	299.0952	307.3426	317.5840	335.7202	348.2121 (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		6.5000		19.6403		0.6300		0.8000		0.7700		44.5887 (80)
West		6.5000		19.6403		0.6300		0.8000		0.7700		44.5887 (80)

Full SAP Calculation Printout



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)
Total gains	443.8577	535.3541	634.7408	754.0046	833.0005	834.1587	798.3678	728.9743	641.4773	524.5834	446.9139	421.5472 (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	17.2592	17.3060	17.3531	17.5926	17.6412	17.8887	17.8887	17.9391	17.7889	17.6412	17.5441	17.4481
alpha	2.1506	2.1537	2.1569	2.1728	2.1761	2.1926	2.1926	2.1959	2.1859	2.1761	2.1696	2.1632
util living area	0.8503	0.7942	0.7101	0.5827	0.4517	0.3288	0.2441	0.2757	0.4366	0.6580	0.8014	0.8617 (86)
Living	18.5130	18.9762	19.5898	20.2410	20.6549	20.8783	20.9544	20.9392	20.7644	20.1601	19.2415	18.4387
Non living	17.1019	17.6682	18.4103	19.1822	19.6479	19.8912	19.9602	19.9519	19.7839	19.1178	18.0155	17.0154
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	19.7277	18.9762	19.5898	20.2410	20.6549	20.8783	20.9544	20.9392	20.7644	20.1601	19.2415	18.7970 (87)
Th 2	19.9544	19.9569	19.9594	19.9721	19.9746	19.9874	19.9874	19.9899	19.9823	19.9746	19.9696	19.9645 (88)
util rest of house	0.8355	0.7753	0.6851	0.5503	0.4123	0.2822	0.1908	0.2192	0.3841	0.6210	0.7799	0.8478 (89)
MIT 2	18.8135	17.6682	18.4103	19.1822	19.6479	19.8912	19.9602	19.9519	19.7839	19.1178	18.0155	17.5456 (90)
Living area fraction									fLA = Living area / (4) =			0.5413 (91)
MIT	19.3083	18.3762	19.0487	19.7553	20.1930	20.4255	20.4983	20.4863	20.3146	19.6820	18.6790	18.2229 (92)
Temperature adjustment												0.0000
adjusted MIT	19.3083	18.3762	19.0487	19.7553	20.1930	20.4255	20.4983	20.4863	20.3146	19.6820	18.6790	18.2229 (93)

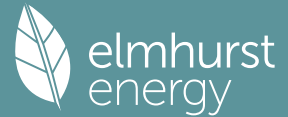
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8252	0.7418	0.6609	0.5431	0.4209	0.3027	0.2180	0.2473	0.4018	0.6095	0.7483	0.8198 (94)
Useful gains	366.2837	397.1472	419.5141	409.4993	350.6398	252.4785	174.0182	180.2966	257.7279	319.7334	334.4062	345.5644 (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	715.5734	640.7826	595.0622	507.7547	396.1614	267.9756	179.3251	187.4454	287.4799	423.6363	543.1026	661.3509 (97)
Space heating kWh	259.8715	163.7230	130.6078	70.7438	33.8681	0.0000	0.0000	0.0000	0.0000	77.3037	150.2614	234.9452 (98a)
Space heating requirement - total per year (kWh/year)												1121.3246
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	259.8715	163.7230	130.6078	70.7438	33.8681	0.0000	0.0000	0.0000	0.0000	77.3037	150.2614	234.9452 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1121.3246
Space heating per m2										(98c) / (4) =		27.2166 (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 %)												202.0851 (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	259.8715	163.7230	130.6078	70.7438	33.8681	0.0000	0.0000	0.0000	0.0000	77.3037	150.2614	234.9452 (98)
Space heating efficiency (main heating system 1)	202.0851	202.0851	202.0851	202.0851	202.0851	0.0000	0.0000	0.0000	0.0000	202.0851	202.0851	202.0851 (210)
Space heating fuel (main heating system)	128.5951	81.0168	64.6301	35.0069	16.7593	0.0000	0.0000	0.0000	0.0000	38.2531	74.3555	116.2605 (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	205.3885	181.8739	193.5990	170.8895	166.1653	150.2642	148.5819	154.1085	155.4081	172.6745	182.8872	203.2131 (64)
Efficiency of water heater (217)m	316.2783	316.2783	316.2783	316.2783	316.2783	316.2783	316.2783	316.2783	316.2783	316.2783	316.2783	316.2783 (216)
Fuel for water heating, kWh/month	64.9392	57.5044	61.2116	54.0314	52.5377	47.5101	46.9782	48.7256	49.1365	54.5957	57.8248	64.2514 (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	7.2039	6.5068	7.2039	6.9715	7.2039	6.9715	7.2039	7.2039	6.9715	7.2039	6.9715	7.2039 (231)
Lighting	12.5503	10.0684	9.0654	6.6417	5.1303	4.1915	4.6800	6.0832	7.9015	10.3672	11.7098	12.8992 (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												554.8773 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												316.2783
Water heating fuel used												659.2465 (219)

Full SAP Calculation Printout



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)	84.8205 (230a)
Total electricity for the above, kWh/year	84.8205 (231)
Electricity for lighting (calculated in Appendix L)	101.2885 (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	1400.2328 (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	554.8773	0.1557	86.4109 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	659.2465	0.1408	92.8099 (264)
Space and water heating			179.2207 (265)
Pumps, fans and electric keep-hot	84.8205	0.1387	11.7656 (267)
Energy for lighting	101.2885	0.1443	14.6191 (268)
Total CO2, kg/year			205.6055 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.9900 (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	554.8773	1.5765	874.7511 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	659.2465	1.5206	1002.4200 (278)
Space and water heating			1877.1711 (279)
Pumps, fans and electric keep-hot	84.8205	1.5128	128.3165 (281)
Energy for lighting	101.2885	1.5338	155.3597 (282)
Total Primary energy kWh/year			2160.8472 (286)
Dwelling Primary energy Rate (DPER)			52.4500 (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	41.2000 (1b)	x 2.5000 (2b)	= 103.0000 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	41.2000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	103.0000 (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	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) = 0.1942 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4442 (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) = 0.3442 (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	0.4389	0.4303	0.4217	0.3787	0.3701	0.3270	0.3270	0.3184	0.3442	0.3701	0.3873	0.4045 (22b)
Effective ac	0.5963	0.5926	0.5889	0.5717	0.5685	0.5535	0.5535	0.5507	0.5592	0.5685	0.5750	0.5818 (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			8.2000	1.1450	9.3893			(27)
top floor exposed new	28.5000	8.2000	20.3000	0.1800	3.6540			(29a)
corridor new	31.5000	2.1000	29.4000	0.1800	5.2920			(29a)
flat roof new	22.1000		22.1000	0.1100	2.4310			(30)
roof terrace new	17.6000		17.6000	0.1100	1.9360			(30)
Total net area of external elements Aum(A, m2)			99.7000					(31)
Fabric heat loss, W/K = Sum (A x U)					24.8023			(33)
Main dwelling								
pw			10.7500	0.0000	0.0000			(32)

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

71.9029 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element	6.2000	0.0500	0.3100
E2 Other lintels (including other steel lintels)	5.2000	0.0500	0.2600
E3 Sill	14.2000	0.0500	0.7100
E4 Jamb	11.6000	0.5600	6.4960
E15 Flat roof with parapet	2.5000	0.0900	0.2250
E16 Corner (normal)	2.5000	-0.0900	-0.2250
E17 Corner (inverted - internal area greater than external area)	5.0000	0.0600	0.3000
E18 Party wall between dwellings	11.6000	0.2400	2.7840
E24 Eaves (insulation at ceiling level - inverted)			

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

10.8600 (36)

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 35.6623 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	20.2688	20.1417	20.0171	19.4318	19.3223	18.8125	18.8125	18.7181	19.0089	19.3223	19.5438	19.7754	(38)
Heat transfer coeff	55.9311	55.8040	55.6794	55.0941	54.9846	54.4748	54.4748	54.3804	54.6712	54.9846	55.2061	55.4377	(39)
Average = Sum(39)m / 12 =												55.0936	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3576	1.3545	1.3514	1.3372	1.3346	1.3222	1.3222	1.3199	1.3270	1.3346	1.3400	1.3456	(40)
HLP (average)												1.3372	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

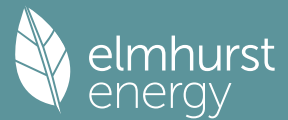
4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.4386 (42)
Hot water usage for mixer showers	48.3397	47.6133	46.5547	44.5293	43.0346	41.3677	40.4203	41.4708	42.6224	44.4122	46.4811	48.1545	(42a)
Hot water usage for baths	20.9109	20.6003	20.1630	19.3567	18.7529	18.0834	17.7217	18.1560	18.6288	19.3452	20.1682	20.8402	(42b)
Hot water usage for other uses	29.3625	28.2948	27.2271	26.1593	25.0916	24.0239	24.0239	25.0916	26.1593	27.2271	28.2948	29.3625	(42c)
Average daily hot water use (litres/day)												90.6485	(43)
Daily hot water use	98.6132	96.5084	93.9448	90.0453	86.8791	83.4750	82.1659	84.7184	87.4106	90.9845	94.9441	98.3573	(44)
Energy conte	156.1791	137.4267	144.3896	123.2675	116.9559	102.6422	99.3725	104.8991	107.7861	123.4651	135.2652	154.0037	(45)
Energy content (annual)										Total = Sum(45)m =		1505.6528	
Distribution loss (46)m = 0.15 x (45)m	23.4269	20.6140	21.6584	18.4901	17.5434	15.3963	14.9059	15.7349	16.1679	18.5198	20.2898	23.1006	(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	202.7740	179.5124	190.9845	168.3593	163.5508	147.7340	145.9674	151.4940	152.8779	170.0600	180.3571	200.5986	(62)
WVHRS	-22.0989	-19.5445	-20.4658	-16.9465	-15.7935	-13.5146	-12.6678	-13.4710	-13.9828	-16.4841	-18.6745	-21.6897	(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	180.6751	159.9680	170.5187	151.4128	147.7573	134.2194	133.2996	138.0231	138.8951	153.5758	161.6825	178.9089	(64)
Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		1848.9364	(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	89.2055	79.3630	85.2855	77.0599	76.1638	70.2020	70.3173	72.1549	71.9123	78.3281	81.0492	88.4821	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	71.9292	71.9292	71.9292	71.9292	71.9292	71.9292	71.9292	71.9292	71.9292	71.9292	71.9292	71.9292	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	63.3028	70.0853	63.3028	65.4129	63.3028	65.4129	63.3028	63.3028	65.4129	63.3028	65.4129	63.3028	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	124.5629	125.8554	122.5982	115.6639	106.9106	98.6838	93.1877	91.8952	95.1524	102.0867	110.8400	119.0668	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.1929	30.1929	30.1929	30.1929	30.1929	30.1929	30.1929	30.1929	30.1929	30.1929	30.1929	30.1929	(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)	-57.5433	-57.5433	-57.5433	-57.5433	-57.5433	-57.5433	-57.5433	-57.5433	-57.5433	-57.5433	-57.5433	-57.5433	(71)
Water heating gains (Table 5)	119.8998	118.0996	114.6310	107.0277	102.3707	97.5028	94.5125	96.9824	99.8782	105.2796	112.5683	118.9276	(72)

Full SAP Calculation Printout



Total internal gains
355.3443 361.6191 348.1108 335.6833 320.1629 306.1782 295.5818 296.7591 305.0223 318.2479 336.3999 348.8760 (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	
West				8.2000	19.6403	0.6300		0.7000	0.7700		49.2190 (80)	
Solar gains	49.2190	96.2829	158.5641	231.2563	283.4133	290.1240	276.2099	237.2602	184.4167	114.2477	61.3703	40.4753 (83)
Total gains	404.5633	457.9020	506.6749	566.9396	603.5762	596.3022	571.7916	534.0193	489.4390	432.4956	397.7703	389.3514 (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	14.7125	14.7461	14.7791	14.9361	14.9658	15.1059	15.1059	15.1321	15.0516	14.9658	14.9058	14.8435	
alpha	1.9808	1.9831	1.9853	1.9957	1.9977	2.0071	2.0071	2.0088	2.0034	1.9977	1.9937	1.9896	
util living area	0.8822	0.8513	0.8034	0.7185	0.6099	0.4814	0.3733	0.4080	0.5774	0.7540	0.8489	0.8892 (86)	
MIT	17.8391	18.2108	18.8023	19.5683	20.2083	20.6580	20.8543	20.8205	20.4755	19.6418	18.6301	17.7799 (87)	
Th 2	19.7960	19.7984	19.8008	19.8118	19.8138	19.8235	19.8235	19.8253	19.8198	19.8138	19.8097	19.8053 (88)	
util rest of house	0.8685	0.8344	0.7807	0.6855	0.5623	0.4138	0.2866	0.3202	0.5118	0.7175	0.8291	0.8763 (89)	
MIT 2	16.2174	16.6738	17.3983	18.3225	19.0647	19.5569	19.7408	19.7175	19.3817	18.4367	17.2068	16.1474 (90)	
Living area fraction									fLA = Living area / (4) =				0.5413 (91)
MIT	17.0951	17.5057	18.1582	18.9968	19.6837	20.1529	20.3435	20.3145	19.9737	19.0890	17.9772	17.0310 (92)	
Temperature adjustment												0.0000	
adjusted MIT	17.0951	17.5057	18.1582	18.9968	19.6837	20.1529	20.3435	20.3145	19.9737	19.0890	17.9772	17.0310 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8282	0.7937	0.7433	0.6598	0.5566	0.4337	0.3263	0.3583	0.5210	0.6915	0.7904	0.8366 (94)
Useful gains	335.0485	363.4371	376.5990	374.0926	335.9434	258.6225	186.5783	191.3425	255.0076	299.0593	314.4007	325.7155 (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	715.6467	703.4491	649.1227	556.2721	438.9806	302.4929	203.9262	212.8733	321.1238	466.7626	600.4863	711.3219 (97)
Space heating kWh	283.1650	228.4881	202.7577	131.1692	76.6597	0.0000	0.0000	0.0000	0.0000	124.7713	205.9816	286.8911 (98a)
Space heating requirement - total per year (kWh/year)												1539.8838
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	283.1650	228.4881	202.7577	131.1692	76.6597	0.0000	0.0000	0.0000	0.0000	124.7713	205.9816	286.8911 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1539.8838
Space heating per m2										(98c) / (4) =		37.3758 (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	283.1650	228.4881	202.7577	131.1692	76.6597	0.0000	0.0000	0.0000	0.0000	124.7713	205.9816	286.8911 (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)	306.7877	247.5494	219.6725	142.1119	83.0550	0.0000	0.0000	0.0000	0.0000	135.1802	223.1654	310.8246 (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	180.6751	159.9680	170.5187	151.4128	147.7573	134.2194	133.2996	138.0231	138.8951	153.5758	161.6825	178.9089 (64)
Efficiency of water heater (217)m	85.0631	84.8588	84.4491	83.7396	82.6618	79.8000	79.8000	79.8000	79.8000	83.5980	84.6039	79.8000 (216)
Fuel for water heating, kWh/month	212.4013	188.5107	201.9188	180.8140	178.7491	168.1947	167.0421	172.9612	174.0540	183.7076	191.1052	210.2015 (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	13.1531	10.5519	9.5008	6.9607	5.3766	4.3928	4.9048	6.3754	8.2810	10.8651	12.2721	13.5186 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-33.1750	-44.2795	-60.3629	-64.3582	-66.7172	-61.4865	-60.8384	-58.7678	-54.6817	-49.0360	-35.6305	-28.9967 (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	-27.1499	-55.8795	-108.8204	-160.2655	-208.8838	-208.6756	-206.0917	-175.7336	-130.5776	-78.6294	-35.8250	-21.5508 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												

Full SAP Calculation Printout



(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												1668.3465	(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												2229.6604	(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)												106.1529	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-2036.4133	(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												2053.7465	(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	1668.3465	0.2100	350.3528	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2229.6604	0.2100	468.2287	(264)
Space and water heating			818.5814	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	106.1529	0.1443	15.3211	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-618.3303	0.1357	-83.8978	
PV Unit electricity exported	-1418.0829	0.1265	-179.3863	
Total			-263.2841	(269)
Total CO2, kg/year			582.5477	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.1400	(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	1668.3465	1.1300	1885.2315	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2229.6604	1.1300	2519.5162	(278)
Space and water heating			4404.7478	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	106.1529	1.5338	162.8208	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-618.3303	1.5015	-928.4391	
PV Unit electricity exported	-1418.0829	0.4644	-658.5112	
Total			-1586.9503	(283)
Total Primary energy kWh/year			3110.7191	(286)
Target Primary Energy Rate (TPER)			75.5000	(287)