

Full SAP Calculation Printout



Property Reference	Maisonette TF				Issued on Date	28/08/2025
Assessment Reference	Proposed		Prop Type Ref			
Property						
SAP Rating	88 B	DER	3.22	TER	11.75	
Environmental	97 A	% DER < TER				72.60
CO ₂ Emissions (t/year)	0.21	DFEE	29.79	TFEE	33.67	
Compliance Check	See BREL	% DFEE < TFEE				11.53
% DPER < TPER	44.85	DPER	33.87	TPER	61.41	
Assessor Details	Mr. Michael Woodbridge				Assessor ID	M818-0001
Client						

SAP 10 WORKSHEET FOR New Build (As Designed) (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	4.6300 (1b)	x 2.7000 (2b)	= 12.5010 (1b) - (3b)
First floor	63.6000 (1c)	x 2.4000 (2c)	= 152.6400 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	68.2300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 165.1410 (5)

2. Ventilation rate

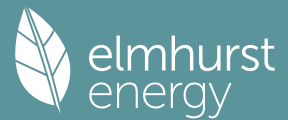
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.1211 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.3211 (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) = 0.2729 (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	0.3480	0.3412	0.3344	0.3002	0.2934	0.2593	0.2593	0.2525	0.2729	0.2934	0.3071	0.3207 (22b)
Effective ac	0.5606	0.5582	0.5559	0.5451	0.5430	0.5336	0.5336	0.5319	0.5372	0.5430	0.5471	0.5514 (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							
Windows			11.9400	1.0536	12.5805		(27)
Ground Floor			4.6300	0.1200	0.5556	75.0000	347.2500 (28a)
External Wall Stone	79.7800	11.9400	67.8400	0.1800	12.2112	9.0000	610.5600 (29a)
Plane Ceiling	63.6000		63.6000	0.0800	5.0880	9.0000	572.4000 (30)
Total net area of external elements Aum(A, m ²)			148.0100				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		30.4353		(33)
Main dwelling							
Party W			29.2400	0.0000	0.0000	20.0000	584.8000 (32)
Party Floor			58.9700			40.0000	2358.8000 (32d)
Party Ceiling			57.2400			30.0000	1717.2000 (32b)
Int W			96.2800			9.0000	866.5200 (32c)
Internal Floor			4.6300			18.0000	83.3400 (32d)
Internal Ceiling			4.6300			9.0000	41.6700 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	7182.5400 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							105.2695 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				9.8600	0.1830	1.8044	

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E3 Sill	8.8000	0.0330	0.2904
E4 Jamb	19.6000	0.0330	0.6468
E5 Ground floor (normal)	5.4600	0.1710	0.9337
E10 Eaves (insulation at ceiling level)	21.0600	0.0350	0.7371
E12 Gable (insulation at ceiling level)	6.0400	0.1080	0.6523
E16 Corner (normal)	7.5000	0.0460	0.3450
E7 Party floor between dwellings (in blocks of flats)	21.6400	0.0485	1.0495
P1 Party wall - Ground floor	5.4600	0.1600	0.8736
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	6.0400	0.0000	0.0000
E18 Party wall between dwellings	10.2000	0.0840	0.8568
E6 Intermediate floor within a dwelling	5.4600	0.0670	0.3658
P2 Party wall - Intermediate floor within a dwelling	5.4600	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	6.0400	0.2400	1.4496
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			10.0050 (36)
Point Thermal bridges		(36a) =	0.0000
Total fabric heat loss		(33) + (36) + (36a) =	40.4403 (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	30.5482	30.4200	30.2944	29.7045	29.5941	29.0803	29.0803	28.9851	29.2782	29.5941	29.8174	30.0508	(38)
Average = Sum(39)m / 12 =	70.9884	70.8603	70.7347	70.1448	70.0344	69.5206	69.5206	69.4254	69.7185	70.0344	70.2577	70.4911	(39)
												70.1442	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.0404	1.0386	1.0367	1.0281	1.0264	1.0189	1.0189	1.0175	1.0218	1.0264	1.0297	1.0331	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	
												31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.2024 (42)
Hot water usage for mixer showers	61.1466	60.2277	58.8886	56.3266	54.4359	52.3275	51.1290	52.4579	53.9146	56.1785	58.7955	60.9123	(42a)
Hot water usage for baths	26.4183	26.0259	25.4734	24.4547	23.6919	22.8460	22.3892	22.9378	23.5352	24.4402	25.4800	26.3290	(42b)
Hot water usage for other uses	37.1848	35.8326	34.4804	33.1282	31.7761	30.4239	30.4239	31.7761	33.1282	34.4804	35.8326	37.1848	(42c)
Average daily hot water use (litres/day)												114.6733	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	124.7496	122.0862	118.8425	113.9096	109.9039	105.5974	103.9420	107.1717	110.5780	115.0991	120.1081	124.4260	(44)
Energy conte	197.5729	173.8491	182.6564	155.9365	147.9517	129.8443	125.7089	132.7010	136.3538	156.1885	171.1160	194.8211	(45)
Energy content (annual)										Total = Sum(45)m =		1904.7001	
Distribution loss (46)m = 0.15 x (45)m	29.6359	26.0774	27.3985	23.3905	22.1928	19.4766	18.8563	19.9052	20.4531	23.4283	25.6674	29.2232	(46)
Water storage loss:													
Store volume												210.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3200	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7128	(55)
Total storage loss	22.0968	19.9584	22.0968	21.3840	22.0968	21.3840	22.0968	22.0968	21.3840	22.0968	21.3840	22.0968	(56)
If cylinder contains dedicated solar storage	22.0968	19.9584	22.0968	21.3840	22.0968	21.3840	22.0968	22.0968	21.3840	22.0968	21.3840	22.0968	(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	242.9321	214.8187	228.0156	199.8325	193.3109	173.7403	171.0681	178.0602	180.2498	201.5477	215.0120	240.1803	(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	242.9321	214.8187	228.0156	199.8325	193.3109	173.7403	171.0681	178.0602	180.2498	201.5477	215.0120	240.1803	(64)
										Total per year (kWh/year) = Sum(64)m =		2438.7681	(64)
												2439	(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)
												0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =													
Heat gains from water heating, kWh/month	101.9803	90.5805	97.0206	86.9657	85.4813	78.2900	78.0856	80.4104	80.4544	88.2200	92.0129	101.0654	(65)

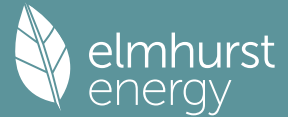
5. Internal gains (see Table 5 and 5a)

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	110.1199	110.1199	110.1199	110.1199	110.1199	110.1199	110.1199	110.1199	110.1199	110.1199	110.1199	110.1199	(66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	99.9576	110.6674	99.9576	103.2895	99.9576	103.2895	99.9576	99.9576	103.2895	99.9576	103.2895	99.9576	(67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	193.1312	195.1353	190.0851	179.3337	165.7619	153.0064	144.4850	142.4809	147.5311	158.2825	171.8543	184.6098	(68)
Pumps, fans	34.0120	34.0120	34.0120	34.0120	34.0120	34.0120	34.0120	34.0120	34.0120	34.0120	34.0120	34.0120	(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)
Water heating gains (Table 5)	-88.0959	-88.0959	-88.0959	-88.0959	-88.0959	-88.0959	-88.0959	-88.0959	-88.0959	-88.0959	-88.0959	-88.0959	(71)
Total internal gains	137.0704	134.7924	130.4041	120.7857	114.8942	108.7361	104.9537	108.0786	111.7423	118.5753	127.7956	135.8406	(72)
	486.1952	496.6311	476.4827	459.4448	436.6497	421.0681	405.4323	406.5530	418.5989	432.8514	458.9754	476.4439	(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	
North		2.1700	10.6334	0.6300	0.0000	0.7700	11.1934 (74)
South		4.7500	46.7521	0.6300	0.0000	0.7700	107.7273 (78)

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West		5.0200			19.6403			0.6300			0.0000			0.7700			47.8280 (80)		

Solar gains	166.7487	291.3825	415.1716	537.1112	618.7432	620.8495	595.8970	534.6221	457.6752	326.7781	201.1380	141.7491	(83)						
Total gains	652.9439	788.0135	891.6543	996.5560	1055.3929	1041.9176	1001.3293	941.1751	876.2741	759.6295	660.1134	618.1930	(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	28.1053	28.1561	28.2061	28.4433	28.4882	28.6987	28.6987	28.7380	28.6172	28.4882	28.3976	28.3036	
alpha	2.8737	2.8771	2.8804	2.8962	2.8992	2.9132	2.9132	2.9159	2.9078	2.8992	2.8932	2.8869	
util living area	0.9102	0.8600	0.7918	0.6810	0.5484	0.4058	0.2987	0.3296	0.5011	0.7277	0.8666	0.9205	86
Living	19.2218	19.6061	20.0373	20.4863	20.7806	20.9328	20.9795	20.9722	20.8730	20.4694	19.7788	19.1449	
Non living	17.9995	18.4723	18.9964	19.5294	19.8576	20.0169	20.0563	20.0527	19.9624	19.5266	18.7005	17.9083	
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	20.0904	19.6061	20.0373	20.4863	20.7806	20.9328	20.9795	20.9722	20.8730	20.4694	19.7788	19.4044	87
Th 2	20.0498	20.0513	20.0529	20.0600	20.0614	20.0676	20.0676	20.0688	20.0652	20.0614	20.0586	20.0558	88
util rest of house	0.8987	0.8436	0.7685	0.6482	0.5051	0.3523	0.2379	0.2662	0.4444	0.6908	0.8481	0.9102	89
MIT 2	19.2324	18.4723	18.9964	19.5294	19.8576	20.0169	20.0563	20.0527	19.9624	19.5266	18.7005	18.2953	90
Living area fraction	FLA = Living area / (4) =												
MIT	19.5510	18.8934	19.3830	19.8848	20.2004	20.3570	20.3992	20.3942	20.3006	19.8768	19.1010	18.7072	92
Temperature adjustment	0.0000												
adjusted MIT	19.5510	18.8934	19.3830	19.8848	20.2004	20.3570	20.3992	20.3942	20.3006	19.8768	19.1010	18.7072	93

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.8920	0.8203	0.7503	0.6417	0.5117	0.3692	0.2597	0.2887	0.4591	0.6829	0.8259	0.8923	94
Useful gains	582.3962	646.3813	669.0235	639.4463	540.0487	384.6848	260.0924	271.7071	402.3330	518.7590	545.2100	551.6062	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	1082.6483	991.5755	911.2741	770.5280	595.3211	400.2331	264.1202	277.2980	432.2952	649.6925	843.1590	1022.6283	97
Space heating kWh	372.1876	231.9705	180.2344	94.3788	41.1227	0.0000	0.0000	0.0000	0.0000	97.4145	214.5233	350.4405	98a
Space heating requirement - total per year (kWh/year)	1582.2723												
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	98b
Solar heating contribution - total per year (kWh/year)	0.0000												
Space heating kWh	372.1876	231.9705	180.2344	94.3788	41.1227	0.0000	0.0000	0.0000	0.0000	97.4145	214.5233	350.4405	98c
Space heating requirement after solar contribution - total per year (kWh/year)	1582.2723												
Space heating per m2	(98c) / (4) = 23.1903												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 %)													311.8107 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	372.1876	231.9705	180.2344	94.3788	41.1227	0.0000	0.0000	0.0000	0.0000	97.4145	214.5233	350.4405	98
Space heating efficiency (main heating system 1)	311.8107	311.8107	311.8107	311.8107	311.8107	0.0000	0.0000	0.0000	0.0000	311.8107	311.8107	311.8107	210
Space heating fuel (main heating system)	119.3633	74.3947	57.8025	30.2680	13.1884	0.0000	0.0000	0.0000	0.0000	31.2416	68.7992	112.3889	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	242.9321	214.8187	228.0156	199.8325	193.3109	173.7403	171.0681	178.0602	180.2498	201.5477	215.0120	240.1803	64
Efficiency of water heater (217)m	308.9918	308.9918	308.9918	308.9918	308.9918	308.9918	308.9918	308.9918	308.9918	308.9918	308.9918	308.9918	216
Fuel for water heating, kWh/month	78.6209	69.5225	73.7934	64.6724	62.5618	56.2281	55.3633	57.6262	58.3348	65.2275	69.5850	77.7303	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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	231
Lighting	24.9890	20.0471	18.0502	13.2243	10.2148	8.3456	9.3183	12.1123	15.7327	20.6421	23.3153	25.6835	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	507.4465												211
Space heating fuel - main system 2	0.0000												213

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Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	308.9918
Water heating fuel used	789.2663 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
Total electricity for the above, kWh/year	0.0000 (231)
Electricity for lighting (calculated in Appendix L)	201.6752 (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	1498.3880 (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	507.4465	0.1561	79.2293 (261)	
Total CO2 associated with community systems			0.0000 (373)	
Water heating (other fuel)	789.2663	0.1410	111.2475 (264)	
Space and water heating			190.4768 (265)	
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)	
Energy for lighting	201.6752	0.1443	29.1080 (268)	
Total CO2, kg/year			219.5847 (272)	
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.2200 (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	507.4465	1.5780	800.7344 (275)	
Total CO2 associated with community systems			0.0000 (473)	
Water heating (other fuel)	789.2663	1.5212	1200.6213 (278)	
Space and water heating			2001.3558 (279)	
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)	
Energy for lighting	201.6752	1.5338	309.3361 (282)	
Total Primary energy kWh/year			2310.6919 (286)	
Dwelling Primary energy Rate (DPER)			33.8700 (287)	

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

1. Overall dwelling characteristics

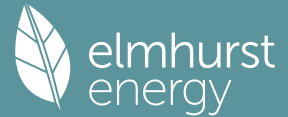
	Area (m2)	Storey height (m)	Volume (m3)	
Main dwelling				
Ground floor	4.6300 (1b)	x 2.7000 (2b)	= 12.5010 (1b) - (3b)	
First floor	63.6000 (1c)	x 2.4000 (2c)	= 152.6400 (1c) - (3c)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	68.2300		(4)	
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 165.1410 (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) = 0.1211 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3711 (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) =	0.3154 (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	0.4022	0.3943	0.3864	0.3470	0.3391	0.2997	0.2997	0.2918	0.3154	0.3391	0.3549	0.3706 (22b)
Effective ac	0.5809	0.5777	0.5747	0.5602	0.5575	0.5449	0.5449	0.5426	0.5498	0.5575	0.5630	0.5687 (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 Opening Type			11.9400	1.1450	13.6718			(27)
Ground Floor			4.6300	0.1300	0.6019			(28a)
External Wall Stone	79.7800	11.9400	67.8400	0.1800	12.2112			(29a)
Plane Ceiling	63.6000		63.6000	0.1100	6.9960			(30)
Total net area of external elements Aum(A, m2)			148.0100					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	33.4809			(33)
Main dwelling								
Party W			29.2400	0.0000	0.0000			(32)

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

113.6588 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	9.8600	0.0500	0.4930
E3 Sill	8.8000	0.0500	0.4400
E4 Jamb	19.6000	0.0500	0.9800
E5 Ground floor (normal)	5.4600	0.1600	0.8736
E10 Eaves (insulation at ceiling level)	21.0600	0.0600	1.2636
E12 Gable (insulation at ceiling level)	6.0400	0.0600	0.3624
E16 Corner (normal)	7.5000	0.0900	0.6750
E7 Party floor between dwellings (in blocks of flats)	21.6400	0.0700	1.5148
P1 Party wall - Ground floor	5.4600	0.0800	0.4368
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	6.0400	0.0000	0.0000
E18 Party wall between dwellings	10.2000	0.0600	0.6120
E6 Intermediate floor within a dwelling	5.4600	0.0000	0.0000
P2 Party wall - Intermediate floor within a dwelling	5.4600	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	6.0400	0.1200	0.7248

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

8.3760 (36)

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 41.8569 (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	31.6558	31.4847	31.3169	30.5289	30.3815	29.6952	29.6952	29.5681	29.9596	30.3815	30.6798	30.9916	(38)
Heat transfer coeff	73.5127	73.3415	73.1738	72.3858	72.2384	71.5521	71.5521	71.4250	71.8164	72.2384	72.5366	72.8484	(39)
Average = Sum(39)m / 12 =												72.3851	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0774	1.0749	1.0725	1.0609	1.0587	1.0487	1.0487	1.0468	1.0526	1.0587	1.0631	1.0677	(40)
HLP (average)												1.0609	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

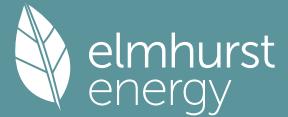
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.2024 (42)
Hot water usage for mixer showers			58.8886	56.3266	54.4359	52.3275	51.1290	52.4579	53.9146	56.1785	58.7955	60.9123	(42a)
Hot water usage for baths	61.1466	60.2277											
Hot water usage for other uses	26.4183	26.0259	25.4734	24.4547	23.6919	22.8460	22.3892	22.9378	23.5352	24.4402	25.4800	26.3290	(42b)
Average daily hot water use (litres/day)	37.1848	35.8326	34.4804	33.1282	31.7761	30.4239	30.4239	31.7761	33.1282	34.4804	35.8326	37.1848	(42c)
												114.6733	(43)
Daily hot water use	124.7496	122.0862	118.8425	113.9096	109.9039	105.5974	103.9420	107.1717	110.5780	115.0991	120.1081	124.4260	(44)
Energy conte	197.5729	173.8491	182.6564	155.9365	147.9517	129.8443	125.7089	132.7010	136.3538	156.1885	171.1160	194.8211	(45)
Energy content (annual)										Total = Sum(45)m =		1904.7001	
Distribution loss (46)m = 0.15 x (45)m	29.6359	26.0774	27.3985	23.3905	22.1928	19.4766	18.8563	19.9052	20.4531	23.4283	25.6674	29.2232	(46)
Water storage loss:													
Store volume												210.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7016	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.9188	(55)
Total storage loss	28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842	(56)
If cylinder contains dedicated solar storage	28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842	(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	249.3195	220.5879	234.4030	206.0138	199.6983	179.9216	177.4555	184.4476	186.4311	207.9350	221.1933	246.5677	(62)
WWHRS	-27.9537	-24.7225	-25.8879	-21.4362	-19.9778	-17.0951	-16.0240	-17.0399	-17.6873	-20.8514	-23.6221	-27.4360	(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	221.3658	195.8655	208.5151	184.5776	179.7205	162.8265	161.4315	167.4077	168.7438	187.0837	197.5712	219.1317	(64)
Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2254.2406	(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	107.0903	95.1959	102.1305	91.9108	90.5912	83.2351	83.1955	85.5204	85.3995	93.3299	96.9579	106.1753	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	110.1199	110.1199	110.1199	110.1199	110.1199	110.1199	110.1199	110.1199	110.1199	110.1199	110.1199	110.1199	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	99.9576	110.6674	99.9576	103.2895	99.9576	103.2895	99.9576	99.9576	103.2895	99.9576	103.2895	99.9576	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	193.1312	195.1353	190.0851	179.3337	165.7619	153.0064	144.4850	142.4809	147.5311	158.2825	171.8543	184.6098	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													

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Pumps, fans	34.0120	34.0120	34.0120	34.0120	34.0120	34.0120	34.0120	34.0120	34.0120	34.0120	34.0120	34.0120 (69)
Losses e.g. evaporation	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)
(negative values) (Table 5)												
Water heating gains (Table 5)	-88.0959	-88.0959	-88.0959	-88.0959	-88.0959	-88.0959	-88.0959	-88.0959	-88.0959	-88.0959	-88.0959	-88.0959 (71)
143.9385	141.6606	137.2722	127.6538	121.7624	115.6043	111.8219	114.9467	118.6104	125.4435	134.6638	142.7087	(72)
Total internal gains	496.0633	506.4992	486.3509	469.3130	446.5179	427.9362	412.3004	413.4212	425.4670	442.7196	468.8436	486.3121 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W
North				2.1700	10.6334		0.6300		0.7000		0.7700		7.0519 (74)
South				4.7500	46.7521		0.6300		0.7000		0.7700		67.8682 (78)
West				5.0200	19.6403		0.6300		0.7000		0.7700		30.1316 (80)
Solar gains	105.0517	183.5709	261.5581	338.3800	389.8082	391.1352	375.4151	336.8119	288.3354	205.8702	126.7169		89.3019 (83)
Total gains	601.1150	690.0702	747.9090	807.6930	836.3261	819.0714	787.7155	750.2331	713.8024	648.5898	595.5605		575.6140 (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)												
tau	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
alpha	29.3031	29.3715	29.4388	29.7593	29.8200	30.1060	30.1060	30.1596	29.9952	29.8200	29.6974	29.5703
util living area	2.9535	2.9581	2.9626	2.9840	2.9880	3.0071	3.0071	3.0106	2.9997	2.9880	2.9798	2.9714
	0.9342	0.9037	0.8603	0.7785	0.6623	0.5116	0.3841	0.4167	0.6017	0.8014	0.9028	0.9407 (86)
MIT	19.1165	19.4232	19.8174	20.2975	20.6646	20.8889	20.9649	20.9544	20.8117	20.3413	19.6631	19.0644 (87)
Th 2	20.0193	20.0214	20.0234	20.0329	20.0347	20.0430	20.0430	20.0445	20.0398	20.0347	20.0311	20.0273 (88)
util rest of house	0.9247	0.8904	0.8410	0.7481	0.6165	0.4474	0.3062	0.3375	0.5388	0.7675	0.8872	0.9321 (89)
MIT 2	17.8434	18.2254	18.7132	19.2975	19.7189	19.9587	20.0240	20.0184	19.8861	19.3639	18.5379	17.7835 (90)
Living area fraction	18.3162	18.6703	19.1233	19.6689	20.0701	20.3041	20.3734	20.3660	20.2299	19.7269	18.9558	18.2593 (92)
MIT	18.3162	18.6703	19.1233	19.6689	20.0701	20.3041	20.3734	20.3660	20.2299	19.7269	18.9558	18.2593 (93)
Temperature adjustment												0.0000
adjusted MIT	18.3162	18.6703	19.1233	19.6689	20.0701	20.3041	20.3734	20.3660	20.2299	19.7269	18.9558	18.2593 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9037	0.8681	0.8203	0.7355	0.6183	0.4655	0.3336	0.3648	0.5519	0.7554	0.8661	0.9120 (94)
Ext temp.	543.2574	599.0732	613.5446	594.0924	517.0837	381.2840	262.8053	273.6871	393.9441	489.9161	515.8080	524.9788 (95)
Heat loss rate W	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)
Space heating kWh	1030.3690	1009.9327	923.6921	779.5144	604.6440	408.1428	269.9956	283.2731	440.2267	659.3108	859.9803	1024.1945 (97)
Space heating requirement - total per year (kWh/year)	362.4111	276.0976	230.7498	133.5038	65.1449	0.0000	0.0000	0.0000	0.0000	126.0297	247.8040	371.4165 (98a)
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)	362.4111	276.0976	230.7498	133.5038	65.1449	0.0000	0.0000	0.0000	0.0000	126.0297	247.8040	371.4165 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1813.1573
Space heating per m ²												26.5742 (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	362.4111	276.0976	230.7498	133.5038	65.1449	0.0000	0.0000	0.0000	0.0000	126.0297	247.8040	371.4165 (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)	392.6447	299.1307	249.9998	144.6412	70.5795	0.0000	0.0000	0.0000	0.0000	136.5435	268.4768	402.4014 (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	221.3658	195.8655	208.5151	184.5776	179.7205	162.8265	161.4315	167.4077	168.7438	187.0837	197.5712	219.1317 (64)
Efficiency of water heater	85.1581	84.8296	84.2875	83.3454	82.0113	79.8000	79.8000	79.8000	79.8000	83.1938	84.5690	79.8000 (216)
Fuel for water heating, kWh/month	259.9469	230.8929	247.3854	221.4610	219.1411	204.0432	202.2951	209.7841	211.4584	224.8768	233.6215	257.0971 (219)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	20.7692	16.6618	15.0021	10.9912	8.4899	6.9363	7.7448	10.0670	13.0760	17.1564	19.3781	21.3465 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-32.0876	-45.3253	-65.2862	-73.5788	-79.5076	-74.2924	-73.3908	-69.2100	-61.8449	-51.9215	-35.3140	-27.7327 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												

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(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	-17.8635	-37.6098	-74.8033	-112.4172	-148.6994	-149.4110	-147.6365	-124.9651	-91.5561	-53.7898	-23.8536	-14.1223	(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												1964.4175	(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												2722.0036	(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)												167.6195	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1686.2193	(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												3253.8212	(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	1964.4175	0.2100	412.5277	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2722.0036	0.2100	571.6208	(264)
Space and water heating			984.1484	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	167.6195	0.1443	24.1927	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-689.4917	0.1345	-92.7601	
PV Unit electricity exported	-996.7276	0.1259	-125.4691	
Total			-218.2292	(269)
Total CO2, kg/year			802.0411	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.7500	(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	1964.4175	1.1300	2219.7917	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2722.0036	1.1300	3075.8640	(278)
Space and water heating			5295.6558	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	167.6195	1.5338	257.1004	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-689.4917	1.4972	-1032.3153	
PV Unit electricity exported	-996.7276	0.4621	-460.5576	
Total			-1492.8729	(283)
Total Primary energy kWh/year			4189.9840	(286)
Target Primary Energy Rate (TPER)			61.4100	(287)