

Full SAP Calculation Printout



Property Reference	Banbury				Issued on Date	28/08/2025	
Assessment Reference	Proposed		Prop Type Ref				
Property							
SAP Rating	87 B		DER	2.77		TER	9.50
Environmental	97 A		% DER < TER				70.84
CO ₂ Emissions (t/year)	0.36		DFEE	37.37		TFEE	40.28
Compliance Check	See BREL		% DFEE < TFEE				7.20
% DPER < TPER	41.90		DPER	28.84		TPER	49.64
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	69.5000 (1b)	x 2.4000 (2b)	= 166.8000 (1b) - (3b)
First floor	69.5000 (1c)	x 2.7000 (2c)	= 187.6500 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	139.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 354.4500 (5)

2. Ventilation rate

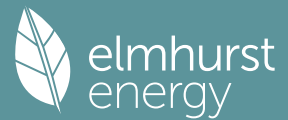
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	5 * 10 = 50.0000 (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) =	50.0000 / (5) = 0.1411 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.3411 (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) = 0.2899 (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	0.3696	0.3624	0.3551	0.3189	0.3116	0.2754	0.2754	0.2682	0.2899	0.3116	0.3261	0.3406 (22b)
Effective ac	0.5683	0.5657	0.5631	0.5508	0.5486	0.5379	0.5379	0.5360	0.5420	0.5486	0.5532	0.5580 (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							
Front Door			2.2300	1.2000	2.6760		(26)
Window			17.6700	1.0536	18.6178		(27)
Patio Doors			10.0800	1.0536	10.6207		(27)
Ground Floor			69.5000	0.1200	8.3400	75.0000	5212.5000 (28a)
External Wall Stone	190.9400	29.9800	160.9600	0.1800	28.9728	9.0000	1448.6400 (29a)
Plane Ceiling	69.5000		69.5000	0.0800	5.5600	9.0000	625.5000 (30)
Total net area of external elements Aum(A, m ²)			329.9400				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	74.7873		(33)
Main dwelling							
Int W T			289.6500			9.0000	2606.8499 (32c)
Int F			69.5000			18.0000	1251.0000 (32d)
Int C			69.5000			9.0000	625.5000 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	11769.9899 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							84.6762 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				19.9100	0.1830	3.6435	
E3 Sill				14.0500	0.0330	0.4637	

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E4 Jamb	45.4400	0.0330	1.4995
E5 Ground floor (normal)	37.4400	0.1710	6.4022
E6 Intermediate floor within a dwelling	37.4400	0.0670	2.5085
E10 Eaves (insulation at ceiling level)	18.6500	0.0350	0.6528
E12 Gable (insulation at ceiling level)	18.4900	0.1080	1.9969
E16 Corner (normal)	25.5000	0.0460	1.1730
E17 Corner (inverted - internal area greater than external area)	5.1000	0.0310	0.1581
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			18.4982 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	93.2855 (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	66.4746	66.1644	65.8602	64.4317	64.1645	62.9203	62.9203	62.6899	63.3995	64.1645	64.7051	65.2704 (38)
Average = Sum(39)m / 12 =	159.7601	159.4499	159.1457	157.7172	157.4500	156.2058	156.2058	155.9754	156.6850	157.4500	157.9906	158.5559 (39)
												157.7159
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1494	1.1471	1.1449	1.1347	1.1327	1.1238	1.1238	1.1221	1.1272	1.1327	1.1366	1.1407 (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												2.9152 (42)
Hot water usage for mixer showers												
	73.0974	71.9989	70.3982	67.3354	65.0752	62.5546	61.1219	62.7106	64.4520	67.1583	70.2869	72.8174 (42a)
Hot water usage for baths												
	31.5575	31.0888	30.4289	29.2119	28.3007	27.2904	26.7446	27.4000	28.1136	29.1947	30.4367	31.4508 (42b)
Hot water usage for other uses												
	44.4841	42.8665	41.2489	39.6313	38.0137	36.3961	36.3961	38.0137	39.6313	41.2489	42.8665	44.4841 (42c)
Average daily hot water use (litres/day)												137.0923 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use												
	149.1391	145.9543	142.0760	136.1787	131.3897	126.2411	124.2626	128.1243	132.1969	137.6020	143.5901	148.7523 (44)
Energy content (annual)	236.1999	207.8370	218.3655	186.4218	176.8758	155.2282	150.2849	158.6446	163.0120	186.7246	204.5704	232.9102 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 2277.0747
	35.4300	31.1755	32.7548	27.9633	26.5314	23.2842	22.5427	23.7967	24.4518	28.0087	30.6856	34.9365 (46)
Water storage loss:												
Store volume												250.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												2.0900 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												1.1286 (55)
Total storage loss												
	34.9866	31.6008	34.9866	33.8580	34.9866	33.8580	34.9866	34.9866	33.8580	34.9866	33.8580	34.9866 (56)
If cylinder contains dedicated solar storage												
	34.9866	31.6008	34.9866	33.8580	34.9866	33.8580	34.9866	34.9866	33.8580	34.9866	33.8580	34.9866 (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												
	294.4489	260.4490	276.6145	242.7918	235.1248	211.5982	208.5339	216.8936	219.3820	244.9736	260.9404	291.1592 (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												
	294.4489	260.4490	276.6145	242.7918	235.1248	211.5982	208.5339	216.8936	219.3820	244.9736	260.9404	291.1592 (64)
12Total per year (kWh/year)												2962.9097 (64)
Electric shower(s)												2963 (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												
	125.1357	111.1954	119.2057	107.0813	105.4104	96.7094	96.5689	99.3485	99.2975	108.6851	113.1156	124.0418 (65)

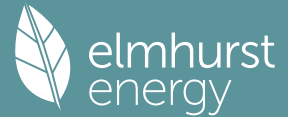
5. Internal gains (see Table 5 and 5a)

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	145.7579	145.7579	145.7579	145.7579	145.7579	145.7579	145.7579	145.7579	145.7579	145.7579	145.7579	145.7579 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	156.6128	173.3927	156.6128	161.8332	156.6128	161.8332	156.6128	156.6128	161.8332	156.6128	161.8332	156.6128 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	308.2722	311.4711	303.4100	286.2488	264.5859	244.2258	230.6240	227.4251	235.4862	252.6474	274.3103	294.6704 (68)
Pumps, fans	37.5758	37.5758	37.5758	37.5758	37.5758	37.5758	37.5758	37.5758	37.5758	37.5758	37.5758	37.5758 (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)	-116.6063	-116.6063	-116.6063	-116.6063	-116.6063	-116.6063	-116.6063	-116.6063	-116.6063	-116.6063	-116.6063	-116.6063 (71)
Total internal gains	168.1931	165.4693	160.2227	148.7240	141.6806	134.3186	129.7969	133.5330	137.9132	146.0822	157.1051	166.7229 (72)
	699.8054	717.0605	686.9728	663.5333	629.6066	607.1049	583.7611	584.2982	601.9599	622.0697	659.9759	684.7334 (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	1.5400	10.6334	0.6300	0.0000	0.7700	7.9437 (74)
East	2.0500	19.6403	0.6300	0.0000	0.7700	19.5314 (76)
South	5.5900	46.7521	0.6300	0.0000	0.7700	126.7780 (78)
West	8.4900	19.6403	0.6300	0.0000	0.7700	80.8884 (80)
North	5.0400	10.6334	0.6300	0.0000	0.7700	25.9976 (74)
East	5.0400	19.6403	0.6300	0.0000	0.7700	48.0186 (76)

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Solar gains	309.1577	562.8702	852.9119	1173.4037	1404.7250	1430.0605	1364.2753	1189.1019	964.9805	645.7164	377.2313	259.9115 (83)
Total gains	1008.9630	1279.9307	1539.8847	1836.9370	2034.3316	2037.1654	1948.0363	1773.4000	1566.9405	1267.7861	1037.2072	944.6449 (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	20.4647	20.5045	20.5437	20.7298	20.7650	20.9303	20.9303	20.9613	20.8663	20.7650	20.6939	20.6201
alpha	2.3643	2.3670	2.3696	2.3820	2.3843	2.3954	2.3954	2.3974	2.3911	2.3843	2.3796	2.3747
util living area	0.9351	0.8932	0.8286	0.7176	0.5826	0.4409	0.3334	0.3757	0.5669	0.7883	0.9038	0.9432 (86)
Living	18.2125	18.6964	19.3295	20.0407	20.5460	20.8342	20.9383	20.9164	20.6857	19.9620	18.9556	18.1250
Non living	16.7109	17.3158	18.0990	18.9596	19.5402	19.8509	19.9456	19.9315	19.7117	18.8938	17.6566	16.6048
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	19.5740	18.6964	19.3295	20.0407	20.5460	20.8342	20.9383	20.9164	20.6857	19.9620	18.9556	18.5272 (87)
Th 2	19.9607	19.9625	19.9643	19.9726	19.9742	19.9815	19.9815	19.9828	19.9787	19.9742	19.9710	19.9677 (88)
util rest of house	0.9268	0.8803	0.8085	0.6863	0.5382	0.3820	0.2624	0.3013	0.5064	0.7560	0.8900	0.9359 (89)
MIT 2	18.6651	17.3158	18.0990	18.9596	19.5402	19.8509	19.9456	19.9315	19.7117	18.8938	17.6566	17.2108 (90)
Living area fraction									fLA = Living area / (4) =			0.1378 (91)
MIT	18.7904	17.5060	18.2685	19.1086	19.6788	19.9864	20.0824	20.0671	19.8459	19.0410	17.8356	17.3922 (92)
Temperature adjustment												0.0000
adjusted MIT	18.7904	17.5060	18.2685	19.1086	19.6788	19.9864	20.0824	20.0671	19.8459	19.0410	17.8356	17.3922 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9157	0.8402	0.7685	0.6567	0.5245	0.3823	0.2696	0.3077	0.4979	0.7210	0.8512	0.9109 (94)
Useful gains	923.8588	1075.4583	1183.4175	1206.2258	1066.9846	778.8856	525.2634	545.7112	780.1384	914.0127	882.9123	860.4460 (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	2314.9807	2010.0230	1872.9031	1610.0686	1256.2644	841.3806	543.9719	571.9850	900.2912	1329.0327	1696.1173	2091.6986 (97)
Space heating kWh	1034.9947	628.0275	512.9773	290.7668	140.8241	0.0000	0.0000	0.0000	0.0000	308.7749	585.5076	916.0519 (98a)
Space heating requirement - total per year (kWh/year)												4417.9248
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	1034.9947	628.0275	512.9773	290.7668	140.8241	0.0000	0.0000	0.0000	0.0000	308.7749	585.5076	916.0519 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4417.9248
Space heating per m2										(98c) / (4) =		31.7836 (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 %)												338.2682 (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	1034.9947	628.0275	512.9773	290.7668	140.8241	0.0000	0.0000	0.0000	0.0000	308.7749	585.5076	916.0519 (98)
Space heating efficiency (main heating system 1)	338.2682	338.2682	338.2682	338.2682	338.2682	0.0000	0.0000	0.0000	0.0000	338.2682	338.2682	338.2682 (210)
Space heating fuel (main heating system)	305.9687	185.6597	151.6481	85.9575	41.6309	0.0000	0.0000	0.0000	0.0000	91.2811	173.0898	270.8064 (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	294.4489	260.4490	276.6145	242.7918	235.1248	211.5982	208.5339	216.8936	219.3820	244.9736	260.9404	291.1592 (64)
Efficiency of water heater (217)m	297.5833	297.5833	297.5833	297.5833	297.5833	297.5833	297.5833	297.5833	297.5833	297.5833	297.5833	297.5833 (216)
Fuel for water heating, kWh/month	98.9467	87.5214	92.9536	81.5879	79.0114	71.1055	70.0758	72.8850	73.7212	82.3210	87.6865	97.8413 (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	35.2167	28.2521	25.4379	18.6369	14.3957	11.7614	13.1322	17.0698	22.1719	29.0908	32.8580	36.1955 (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												1306.0422 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												297.5833
Water heating fuel used												995.6574 (219)

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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)	284.2189	(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	2585.9185	(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	1306.0422	0.1556	203.2600 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	995.6574	0.1409	140.3029 (264)
Space and water heating			343.5629 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	284.2189	0.1443	41.0216 (268)
Total CO2, kg/year			384.5845 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			2.7700 (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	1306.0422	1.5761	2058.4563 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	995.6574	1.5211	1514.4473 (278)
Space and water heating			3572.9035 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	284.2189	1.5338	435.9444 (282)
Total Primary energy kWh/year			4008.8479 (286)
Dwelling Primary energy Rate (DPER)			28.8400 (287)

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

1. Overall dwelling characteristics

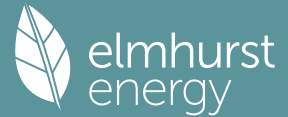
	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	69.5000 (1b)	x 2.4000 (2b)	= 166.8000 (1b) - (3b)
First floor	69.5000 (1c)	x 2.7000 (2c)	= 187.6500 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	139.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	354.4500 (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	4 * 10 = 40.0000 (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) =	40.0000 / (5) = 0.1129 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3629 (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) = 0.3084 (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	0.3932	0.3855	0.3778	0.3393	0.3316	0.2930	0.2930	0.2853	0.3084	0.3316	0.3470	0.3624 (22b)
Effective ac	0.5773	0.5743	0.5714	0.5576	0.5550	0.5429	0.5429	0.5407	0.5476	0.5550	0.5602	0.5657 (25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			2.2300	1.0000	2.2300			(26)
TER Opening Type			27.7500	1.1450	31.7748			(27)
Ground Floor			69.5000	0.1300	9.0350			(28a)
External Wall Stone	190.9400	29.9800	160.9600	0.1800	28.9728			(29a)
Plane Ceiling	69.5000		69.5000	0.1100	7.6450			(30)
Total net area of external elements Aum(A, m2)			329.9400					(31)
Fabric heat loss, W/K = Sum (A x U)					79.6576			(33)

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

84.6762 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)	19.9100	0.0500	0.9955	
E3 Sill	14.0500	0.0500	0.7025	
E4 Jamb	45.4400	0.0500	2.2720	
E5 Ground floor (normal)	37.4400	0.1600	5.9904	
E6 Intermediate floor within a dwelling	37.4400	0.0000	0.0000	
E10 Eaves (insulation at ceiling level)	18.6500	0.0600	1.1190	
E12 Gable (insulation at ceiling level)	18.4900	0.0600	1.1094	
E16 Corner (normal)	25.5000	0.0900	2.2950	
E17 Corner (inverted - internal area greater than external area)	5.1000	-0.0900	-0.4590	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				14.0248 (36)
Point Thermal bridges				0.0000 (36a)
Total fabric heat loss				93.6824 (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	67.5281	67.1769	66.8327	65.2159	64.9134	63.5051	63.5051	63.2444	64.0476	64.9134	65.5253	66.1651	(38)
Average = Sum(39)m / 12 =													158.8968 (39)
HLP	1.1598	1.1573	1.1548	1.1432	1.1410	1.1308	1.1308	1.1290	1.1347	1.1410	1.1454	1.1500	(40)
HLP (average)												1.1431	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

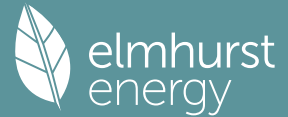
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.9152 (42)
Hot water usage for mixer showers													
Hot water usage for baths													
Hot water usage for other uses													
Average daily hot water use (litres/day)													137.0923 (43)
Daily hot water use													
Energy conte													
Energy content (annual)													
Distribution loss (46)m = 0.15 x (45)m													
Water storage loss:													
Store volume													250.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.8903 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													1.0208 (55)
Total storage loss													
If cylinder contains dedicated solar storage													
Primary loss													
Combi loss													
Total heat required for water heating calculated for each month													
WWHRS													
PV diverter													
Solar input													
FGHRS													
Output from w/h													
12Total per year (kWh/year)													
Electric shower(s)													
Heat gains from water heating, kWh/month													

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

Metabolic gains (Table 5), Watts													
(66)m													
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
Pumps, fans													
Losses e.g. evaporation (negative values) (Table 5)													
Water heating gains (Table 5)													
Total internal gains													

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6. Solar gains

[Jan]	Area m2		Solar flux Table 6a W/m2		Specific data or Table 6b		Specific data or Table 6c		FF Access factor Table 6d		Gains W	
North	6.5800		10.6334		0.6300		0.7000		0.7700		21.3830 (74)	
East	7.0900		19.6403		0.6300		0.7000		0.7700		42.5564 (76)	
South	5.5900		46.7521		0.6300		0.7000		0.7700		79.8701 (78)	
West	8.4900		19.6403		0.6300		0.7000		0.7700		50.9597 (80)	
Solar gains	194.7693	354.6082	537.3345	739.2443	884.9767	900.9381	859.4934	749.1342	607.9377	406.8013	237.6557	163.7442 (83)
Total gains	893.9809	1071.0749	1223.7135	1402.1838	1513.9896	1504.4492	1439.6607	1329.8386	1206.3039	1028.2772	897.0379	847.8839 (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	20.2806	20.3248	20.3684	20.5757	20.6149	20.7996	20.7996	20.8342	20.7281	20.6149	20.5357	20.4535
alpha	2.3520	2.3550	2.3579	2.3717	2.3743	2.3866	2.3866	2.3889	2.3819	2.3743	2.3690	2.3636
util living area	0.9488	0.9227	0.8823	0.8045	0.6944	0.5547	0.4331	0.4768	0.6673	0.8461	0.9265	0.9542 (86)
MIT	18.0311	18.4190	18.9871	19.7126	20.3130	20.7209	20.8890	20.8571	20.5394	19.7362	18.7629	17.9677 (87)
Th 2	19.9523	19.9543	19.9563	19.9657	19.9675	19.9757	19.9757	19.9772	19.9726	19.9675	19.9639	19.9602 (88)
util rest of house	0.9420	0.9127	0.8667	0.7782	0.6516	0.4893	0.3463	0.3893	0.6070	0.8193	0.9152	0.9481 (89)
MIT 2	16.4790	16.9681	17.6808	18.5786	19.2919	19.7482	19.9088	19.8859	19.5678	18.6291	17.4150	16.4031 (90)
Living area fraction	16.6928	17.1680	17.8608	18.7348	19.4326	19.8822	20.0439	20.0197	19.7017	18.7816	17.6007	16.6187 (92)
Temperature adjustment												0.0000
adjusted MIT	16.6928	17.1680	17.8608	18.7348	19.4326	19.8822	20.0439	20.0197	19.7017	18.7816	17.6007	16.6187 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9106	0.8756	0.8260	0.7405	0.6266	0.4828	0.3524	0.3932	0.5891	0.7803	0.8791	0.9186 (94)
Useful gains	814.0669	937.7858	1010.7784	1038.3348	948.7106	726.3535	507.3752	522.8566	710.6101	802.3962	788.6057	778.8969 (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	1997.8530	1973.4150	1823.5737	1562.7357	1226.3557	830.2946	541.3309	568.0315	883.5530	1297.5748	1671.7926	1985.0911 (97)
Space heating kWh	880.7369	695.9428	604.7197	377.5687	206.5680	0.0000	0.0000	0.0000	0.0000	368.4129	635.8945	897.4085 (98a)
Space heating requirement - total per year (kWh/year)												4667.2520
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	880.7369	695.9428	604.7197	377.5687	206.5680	0.0000	0.0000	0.0000	0.0000	368.4129	635.8945	897.4085 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4667.2520
Space heating per m2										(98c) / (4) =		33.5774 (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	880.7369	695.9428	604.7197	377.5687	206.5680	0.0000	0.0000	0.0000	0.0000	368.4129	635.8945	897.4085 (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)	954.2111	754.0009	655.1676	409.0668	223.8006	0.0000	0.0000	0.0000	0.0000	399.1472	688.9432	972.2736 (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	257.6896	227.8759	242.3246	213.9316	207.9002	187.9275	186.0359	193.1811	195.0034	216.7047	229.4671	255.0187 (64)
Efficiency of water heater	86.5895	86.3965	86.0244	85.3198	84.0454	79.8000	79.8000	79.8000	79.8000	85.2395	86.2214	79.8000 (216)
Fuel for water heating, kWh/month	297.5992	263.7559	281.6928	250.7410	247.3666	235.4981	233.1277	242.0816	244.3651	254.2302	266.1369	294.3506 (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	32.5410	26.1056	23.5052	17.2209	13.3019	10.8678	12.1345	15.7729	20.4874	26.8806	30.3615	33.4455 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-61.1184	-84.2431	-118.3930	-129.9995	-137.5254	-127.3132	-125.6005	-119.7648	-109.2236	-94.6980	-66.4477	-53.0568 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)	-40.6433	-84.7145	-167.0012	-248.9165	-327.3841	-328.4214	-324.6822	-275.8140	-203.2890	-120.6600	-54.0901	-32.2113 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												

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(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												5056.6111	(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												3110.9457	(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)												262.6248	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-3435.2116	(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												5080.9700	(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	5056.6111	0.2100	1061.8883	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3110.9457	0.2100	653.2986	(264)
Space and water heating			1715.1869	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	262.6248	0.1443	37.9049	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1227.3839	0.1351	-165.8176	
PV Unit electricity exported	-2207.8277	0.1261	-278.4377	
Total			-444.2553	(269)
Total CO2, kg/year			1320.7658	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.5000	(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	5056.6111	1.1300	5713.9705	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3110.9457	1.1300	3515.3687	(278)
Space and water heating			9229.3392	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	262.6248	1.5338	402.8227	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1227.3839	1.4993	-1840.2526	
PV Unit electricity exported	-2207.8277	0.4629	-1022.0781	
Total			-2862.3307	(283)
Total Primary energy kWh/year			6899.9320	(286)
Target Primary Energy Rate (TPER)			49.6400	(287)