

Full SAP Calculation Printout



Property Reference	Sherston				Issued on Date	28/08/2025
Assessment Reference	Proposed		Prop Type Ref			
Property						
SAP Rating	86 B	DER	3.21	TER	10.33	
Environmental	97 A	% DER < TER				68.93
CO ₂ Emissions (t/year)	0.29	DFEE	33.65	TFEE	35.13	
Compliance Check	See BREL	% DFEE < TFEE				4.19
% DPER < TPER	37.53	DPER	33.62	TPER	53.82	
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	47.8500 (1b)	x 2.3800 (2b)	= 113.8830 (1b) - (3b)
First floor	47.8500 (1c)	x 2.7000 (2c)	= 129.1950 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	95.7000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 243.0780 (5)

2. Ventilation rate

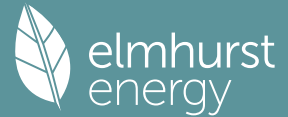
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	4 * 10 = 40.0000 (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) =	40.0000 / (5) = 0.1646 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4146 (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) = 0.3524 (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	0.4493	0.4405	0.4317	0.3876	0.3788	0.3348	0.3348	0.3259	0.3524	0.3788	0.3964	0.4140 (22b)
Effective ac	0.6009	0.5970	0.5932	0.5751	0.5717	0.5560	0.5560	0.5531	0.5621	0.5717	0.5786	0.5857 (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			10.5700	1.0536	11.1370		(27)
Patio Door			5.0400	1.0536	5.3103		(27)
Ground Floor			47.8500	0.1200	5.7420	75.0000	3588.7500 (28a)
External Wall	108.4000	15.6100	92.7900	0.1800	16.7022	9.0000	835.1100 (29a)
Plane Ceiling	47.8500		47.8500	0.0800	3.8280	9.0000	430.6500 (30)
Total net area of external elements Aum(A, m ²)			204.1000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	42.7195		(33)
Main dwelling							
Party W			41.9000	0.0000	0.0000	20.0000	838.0000 (32)
Int W GF			62.6700			9.0000	564.0300 (32c)
Int W FF			109.9200			9.0000	989.2800 (32c)
Int F			47.8500			18.0000	861.3000 (32d)
Int C			47.8500			9.0000	430.6500 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	8537.7700 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							89.2139 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				10.9600	0.1830	2.0057	

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E3 Sill	6.8600	0.0330	0.2264
E4 Jamb	26.4800	0.0330	0.8738
E5 Ground floor (normal)	21.2900	0.1710	3.6406
E10 Eaves (insulation at ceiling level)	9.9000	0.0350	0.3465
E12 Gable (insulation at ceiling level)	11.3000	0.1080	1.2204
E16 Corner (normal)	15.3000	0.0460	0.7038
E17 Corner (inverted - internal area greater than external area)	5.0900	0.0310	0.1578
E6 Intermediate floor within a dwelling	21.2900	0.0670	1.4264
P1 Party wall - Ground floor	8.2300	0.1600	1.3168
P2 Party wall - Intermediate floor within a dwelling	8.2300	0.0000	0.0000
E18 Party wall between dwellings	10.2000	0.0840	0.8568
P4 Party wall - Roof (insulation at ceiling level)	8.2300	0.2400	1.9752
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			14.7502 (36)
Point Thermal bridges		(36a) =	0.0000
Total fabric heat loss		(33) + (36) + (36a) =	57.4697 (37)

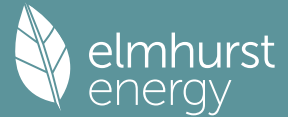
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 48.2036	Feb 47.8892	Mar 47.5811	Apr 46.1337	May 45.8629	Jun 44.6024	Jul 44.6024	Aug 44.3689	Sep 45.0879	Oct 45.8629	Nov 46.4108	Dec 46.9835 (38)
Heat transfer coeff	105.6733	105.3589	105.0508	103.6035	103.3327	102.0721	102.0721	101.8387	102.5577	103.3327	103.8805	104.4532 (39)
Average = Sum(39)m / 12 =												103.6022
HLP	Jan 1.1042	Feb 1.1009	Mar 1.0977	Apr 1.0826	May 1.0798	Jun 1.0666	Jul 1.0666	Aug 1.0641	Sep 1.0717	Oct 1.0798	Nov 1.0855	Dec 1.0915 (40)
HLP (average)												1.0826
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)												
Assumed occupancy												2.6960 (42)
Hot water usage for mixer showers	69.4227	68.3795	66.8592	63.9504	61.8038	59.4099	58.0493	59.5580	61.2119	63.7822	66.7535	69.1568 (42a)
Hot water usage for baths	29.9773	29.5321	28.9051	27.7492	26.8836	25.9238	25.4054	26.0279	26.7058	27.7328	28.9126	29.8759 (42b)
Hot water usage for other uses	42.2397	40.7037	39.1677	37.6317	36.0957	34.5597	34.5597	36.0957	37.6317	39.1677	40.7037	42.2397 (42c)
Average daily hot water use (litres/day)												130.1988 (43)
Daily hot water use	Jan 141.6397	Feb 138.6152	Mar 134.9320	Apr 129.3313	May 124.7831	Jun 119.8935	Jul 118.0144	Aug 121.6817	Sep 125.5494	Oct 130.6827	Nov 136.3697	Dec 141.2724 (44)
Energy conte	224.3227	197.3862	207.3855	177.0481	167.9821	147.4230	142.7282	150.6673	154.8150	177.3352	194.2837	221.1984 (45)
Energy content (annual)										Total = Sum(45)m =		2162.5752
Distribution loss (46)m = 0.15 x (45)m	33.6484	29.6079	31.1078	26.5572	25.1973	22.1135	21.4092	22.6001	23.2222	26.6003	29.1425	33.1798 (46)
Water storage loss:												210.0000 (47)
Store volume												1.3200 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												0.7128 (55)
Enter (49) or (54) in (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	269.6819	238.3558	252.7447	220.9441	213.3413	191.3190	188.0874	196.0265	198.7110	222.6944	238.1797	266.5576 (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	269.6819	238.3558	252.7447	220.9441	213.3413	191.3190	188.0874	196.0265	198.7110	222.6944	238.1797	266.5576 (64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2696.6432 (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)
												0.0000 (64a)
Heat gains from water heating, kWh/month	110.8746	98.4066	105.2430	93.9853	92.1414	84.1350	83.7445	86.3843	86.5928	95.2513	99.7161	109.8358 (65)

5. Internal gains (see Table 5 and 5a)												
Metabolic gains (Table 5), Watts												
(66)m	Jan 134.7997	Feb 134.7997	Mar 134.7997	Apr 134.7997	May 134.7997	Jun 134.7997	Jul 134.7997	Aug 134.7997	Sep 134.7997	Oct 134.7997	Nov 134.7997	Dec 134.7997 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	130.6319	144.6281	130.6319	134.9863	130.6319	134.9863	130.6319	130.6319	134.9863	130.6319	134.9863	130.6319 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	249.1829	251.7687	245.2527	231.3810	213.8704	197.4129	186.4183	183.8325	190.3485	204.2203	221.7308	238.1883 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.4800	36.4800	36.4800	36.4800	36.4800	36.4800	36.4800	36.4800	36.4800	36.4800	36.4800	36.4800 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-107.8398	-107.8398	-107.8398	-107.8398	-107.8398	-107.8398	-107.8398	-107.8398	-107.8398	-107.8398	-107.8398	-107.8398 (71)
Water heating gains (Table 5)	149.0251	146.4384	141.4557	130.5351	123.8460	116.8541	112.5598	116.1079	120.2678	128.0260	138.4946	147.6288 (72)
Total internal gains	592.2798	606.2752	580.7802	560.3423	531.7881	512.6932	493.0498	494.0122	509.0425	526.3180	558.6516	579.8889 (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	3.4500	10.6334	0.6300	0.0000	0.7700	17.7960	(74)
South	6.4600	46.7521	0.6300	0.0000	0.7700	146.5091	(78)
West	0.6600	19.6403	0.6300	0.0000	0.7700	6.2881	(80)

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North				5.0400		10.6334		0.6300		0.0000		0.7700		25.9976 (74)	
Solar gains	196.5909	335.9369	468.1171	603.4220	703.9018	712.9142	681.3255	603.0308	513.8304	373.0226	235.5289	168.2769	(83)		
Total gains	788.8707	942.2121	1048.8973	1163.7642	1235.6900	1225.6074	1174.3753	1097.0430	1022.8728	899.3406	794.1805	748.1659	(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	22.4428	22.5097	22.5758	22.8912	22.9511	23.2346	23.2346	23.2878	23.1246	22.9511	22.8301	22.7049	
alpha	2.4962	2.5006	2.5051	2.5261	2.5301	2.5490	2.5490	2.5525	2.5416	2.5301	2.5220	2.5137	
util living area	0.9212	0.8829	0.8324	0.7425	0.6221	0.4769	0.3614	0.3977	0.5771	0.7773	0.8865	0.9292	(86)
Living	18.5938	18.9937	19.4892	20.0897	20.5503	20.8384	20.9418	20.9243	20.7247	20.1211	19.2728	18.5319	
Non living	17.2019	17.7006	18.3147	19.0487	19.5834	19.8995	19.9939	19.9831	19.7893	19.1057	18.0662	17.1307	
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	19.7691	18.9937	19.4892	20.0897	20.5503	20.8384	20.9418	20.9243	20.7247	20.1211	19.2728	18.8771	(87)
Th 2	19.9974	20.0001	20.0027	20.0151	20.0174	20.0282	20.0282	20.0302	20.0240	20.0174	20.0127	20.0078	(88)
util rest of house	0.9114	0.8690	0.8126	0.7126	0.5786	0.4173	0.2883	0.3228	0.5178	0.7444	0.8708	0.9203	(89)
MIT 2	18.8829	17.7006	18.3147	19.0487	19.5834	19.8995	19.9939	19.9831	19.7893	19.1057	18.0662	17.6491	(90)
Living area fraction													
MIT	19.0394	17.9290	18.5221	19.2325	19.7542	20.0653	20.1613	20.1494	19.9545	19.2850	18.2793	17.8660	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0394	17.9290	18.5221	19.2325	19.7542	20.0653	20.1613	20.1494	19.9545	19.2850	18.2793	17.8660	(93)

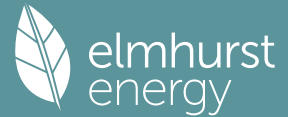
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9004	0.8329	0.7775	0.6859	0.5660	0.4196	0.2986	0.3323	0.5132	0.7160	0.8356	0.8954	(94)
Useful gains	710.3308	784.7223	815.5462	798.2044	699.3733	514.3104	350.6760	364.5918	524.9569	643.8959	663.6556	669.8933	(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	1557.5627	1372.7212	1262.9342	1070.4856	832.2603	557.8510	363.5083	381.8288	600.4215	897.4476	1161.3128	1427.4540	(97)
Space heating kWh	630.3405	395.1353	332.8566	196.0425	98.8679	0.0000	0.0000	0.0000	0.0000	188.6424	358.3132	563.6252	(98a)
Space heating requirement - total per year (kWh/year)												2763.8237	
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	630.3405	395.1353	332.8566	196.0425	98.8679	0.0000	0.0000	0.0000	0.0000	188.6424	358.3132	563.6252	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2763.8237	
Space heating per m2										(98c) / (4) =		28.8801	(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 %)													300.2361 (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	630.3405	395.1353	332.8566	196.0425	98.8679	0.0000	0.0000	0.0000	0.0000	188.6424	358.3132	563.6252	(98)
Space heating efficiency (main heating system 1)	300.2361	300.2361	300.2361	300.2361	300.2361	0.0000	0.0000	0.0000	0.0000	300.2361	300.2361	300.2361	(210)
Space heating fuel (main heating system)	209.9483	131.6082	110.8650	65.2961	32.9301	0.0000	0.0000	0.0000	0.0000	62.8314	119.3438	187.7273	(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	269.6819	238.3558	252.7447	220.9441	213.3413	191.3190	188.0874	196.0265	198.7110	222.6944	238.1797	266.5576	(64)
Efficiency of water heater (217)m	305.9950	305.9950	305.9950	305.9950	305.9950	305.9950	305.9950	305.9950	305.9950	305.9950	305.9950	305.9950	(216)
Fuel for water heating, kWh/month	88.1328	77.8953	82.5977	72.2051	69.7205	62.5236	61.4675	64.0620	64.9393	72.7771	77.8378	87.1117	(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	34.4637	27.6481	24.8940	18.2384	14.0879	11.5099	12.8514	16.7048	21.6979	28.4688	32.1554	35.4216	(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												920.5502	(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	305.9950	
Water heating fuel used	881.2704	(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)	278.1420	(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	2079.9626	(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	920.5502	0.1554	143.0909	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	881.2704	0.1410	124.2684	(264)
Space and water heating			267.3593	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	278.1420	0.1443	40.1445	(268)
Total CO2, kg/year			307.5038	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.2100	(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	920.5502	1.5754	1450.2461	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	881.2704	1.5214	1340.7748	(278)
Space and water heating			2791.0209	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	278.1420	1.5338	426.6235	(282)
Total Primary energy kWh/year			3217.6445	(286)
Dwelling Primary energy Rate (DPER)			33.6200	(287)

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

1. Overall dwelling characteristics

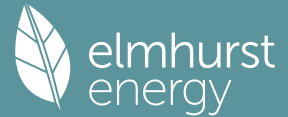
	Area (m2)	Storey height (m)	Volume (m3)	
Main dwelling				
Ground floor	47.8500 (1b)	x 2.3800 (2b)	= 113.8830	(1b) - (3b)
First floor	47.8500 (1c)	x 2.7000 (2c)	= 129.1950	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	95.7000			(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 243.0780	(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	3 * 10 =	30.0000 (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) =	30.0000 / (5) = 0.1234 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3734 (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) =	0.3174 (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	0.4047	0.3968	0.3888	0.3491	0.3412	0.3015	0.3015	0.2936	0.3174	0.3412	0.3571	0.3730 (22b)
Effective ac	0.5819	0.5787	0.5756	0.5610	0.5582	0.5455	0.5455	0.5431	0.5504	0.5582	0.5638	0.5695 (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			15.6100	1.1450	17.8740			(27)
Ground Floor			47.8500	0.1300	6.2205			(28a)
External Wall	108.4000	15.6100	92.7900	0.1800	16.7022			(29a)
Plane Ceiling	47.8500		47.8500	0.1100	5.2635			(30)
Total net area of external elements Aum(A, m2)			204.1000					(31)
Fabric heat loss, W/K = Sum (A x U)					46.0602			(33)
Main dwelling								
Party W			41.9000	0.0000	0.0000			(32)

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

89.2139 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	10.9600	0.0500	0.5480
E3 Sill	6.8600	0.0500	0.3430
E4 Jamb	26.4800	0.0500	1.3240
E5 Ground floor (normal)	21.2900	0.1600	3.4064
E10 Eaves (insulation at ceiling level)	9.9000	0.0600	0.5940
E12 Gable (insulation at ceiling level)	11.3000	0.0600	0.6780
E16 Corner (normal)	15.3000	0.0900	1.3770
E17 Corner (inverted - internal area greater than external area)	5.0900	-0.0900	-0.4581
E6 Intermediate floor within a dwelling	21.2900	0.0000	0.0000
P1 Party wall - Ground floor	8.2300	0.0800	0.6584
P2 Party wall - Intermediate floor within a dwelling	8.2300	0.0000	0.0000
E18 Party wall between dwellings	10.2000	0.0600	0.6120
P4 Party wall - Roof (insulation at ceiling level)	8.2300	0.1200	0.9876

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

10.0703 (36)

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 56.1305 (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	46.6765	46.4215	46.1714	44.9971	44.7774	43.7546	43.7546	43.5652	44.1486	44.7774	45.2219	45.6866	(38)
Average = Sum(39)m / 12 =	102.8071	102.5520	102.3020	101.1277	100.9079	99.8851	99.8851	99.6957	100.2791	100.9079	101.3524	101.8171	(39)
												101.1266	

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.0743	1.0716	1.0690	1.0567	1.0544	1.0437	1.0437	1.0418	1.0478	1.0544	1.0591	1.0639	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

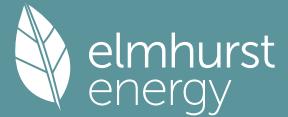
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.6960 (42)
Hot water usage for mixer showers	69.4227	68.3795	66.8592	63.9504	61.8038	59.4099	58.0493	59.5580	61.2119	63.7822	66.7535	69.1568	(42a)
Hot water usage for baths	29.9773	29.5321	28.9051	27.7492	26.8836	25.9238	25.4054	26.0279	26.7058	27.7328	28.9126	29.8759	(42b)
Hot water usage for other uses	42.2397	40.7037	39.1677	37.6317	36.0957	34.5597	34.5597	36.0957	37.6317	39.1677	40.7037	42.2397	(42c)
Average daily hot water use (litres/day)												130.1988	(43)
Daily hot water use	141.6397	138.6152	134.9320	129.3313	124.7831	119.8935	118.0144	121.6817	125.5494	130.6827	136.3697	141.2724	(44)
Energy conte	224.3227	197.3862	207.3855	177.0481	167.9821	147.4230	142.7282	150.6673	154.8150	177.3352	194.2837	221.1984	(45)
Energy content (annual)										Total = Sum(45)m =		2162.5752	
Distribution loss (46)m = 0.15 x (45)m	33.6484	29.6079	31.1078	26.5572	25.1973	22.1135	21.4092	22.6001	23.2222	26.6003	29.1425	33.1798	(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	276.0693	244.1251	259.1321	227.1254	219.7287	197.5004	194.4747	202.4139	204.8923	229.0818	244.3610	272.9450	(62)
WWHRS	-31.7372	-28.0686	-29.3918	-24.3376	-22.6818	-19.4090	-18.1928	-19.3462	-20.0813	-23.6736	-26.8193	-31.1495	(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	244.3321	216.0565	229.7402	202.7878	197.0469	178.0914	176.2819	183.0677	184.8111	205.4082	217.5417	241.7955	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2476.9610	(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)
												0.0000	(64a)
Heat gains from water heating, kWh/month	115.9846	103.0220	110.3529	98.9304	97.2513	89.0800	88.8544	91.4942	91.5379	100.3612	104.6612	114.9457	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	134.7997	134.7997	134.7997	134.7997	134.7997	134.7997	134.7997	134.7997	134.7997	134.7997	134.7997	134.7997	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	130.6319	144.6281	130.6319	134.9863	130.6319	134.9863	130.6319	130.6319	134.9863	130.6319	134.9863	130.6319	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	249.1829	251.7687	245.2527	231.3810	213.8704	197.4129	186.4183	183.8325	190.3485	204.2203	221.7308	238.1883	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.4800	36.4800	36.4800	36.4800	36.4800	36.4800	36.4800	36.4800	36.4800	36.4800	36.4800	36.4800	(69)

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Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-107.8398	-107.8398	-107.8398	-107.8398	-107.8398	-107.8398	-107.8398	-107.8398	-107.8398	-107.8398	-107.8398	-107.8398 (71)
Water heating gains (Table 5)	155.8932	153.3066	148.3239	137.4033	130.7141	123.7223	119.4279	122.9760	127.1359	134.8941	145.3628	154.4970 (72)
Total internal gains	602.1480	616.1433	590.6484	570.2104	541.6563	519.5613	499.9180	500.8804	515.9106	536.1862	568.5198	589.7571 (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	8.4900	10.6334	0.6300	0.7000	0.7700	27.5900 (74)
South	6.4600	46.7521	0.6300	0.7000	0.7700	92.3007 (78)
West	0.6600	19.6403	0.6300	0.7000	0.7700	3.9615 (80)

Solar gains	123.8522	211.6403	294.9138	380.1558	443.4582	449.1360	429.2350	379.9094	323.7131	235.0042	148.3832	106.0145 (83)
Total gains	726.0002	827.7836	885.5621	950.3663	985.1144	968.6973	929.1531	880.7898	839.6238	771.1904	716.9030	695.7716 (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	23.0685	23.1259	23.1824	23.4516	23.5026	23.7433	23.7433	23.7884	23.6500	23.5026	23.3996	23.2928
alpha	2.5379	2.5417	2.5455	2.5634	2.5668	2.5829	2.5829	2.5859	2.5767	2.5668	2.5600	2.5529
util living area	0.9318	0.9056	0.8709	0.8032	0.7020	0.5609	0.4343	0.4696	0.6478	0.8197	0.9042	0.9378 (86)
MIT	18.5608	18.8844	19.3269	19.9135	20.4167	20.7724	20.9147	20.8932	20.6494	20.0141	19.2065	18.5096 (87)
Th 2	20.0219	20.0241	20.0262	20.0363	20.0382	20.0470	20.0470	20.0487	20.0437	20.0382	20.0344	20.0304 (88)
util rest of house	0.9232	0.8940	0.8545	0.7774	0.6609	0.4981	0.3521	0.3873	0.5893	0.7907	0.8906	0.9299 (89)
MIT 2	17.1758	17.5819	18.1361	18.8630	19.4612	19.8597	19.9948	19.9797	19.7360	18.9997	17.9995	17.1164 (90)
Living area fraction	17.4203	17.8119	18.3464	19.0486	19.6299	20.0209	20.1572	20.1410	19.8973	19.1789	18.2127	17.3624 (91)
MIT	17.4203	17.8119	18.3464	19.0486	19.6299	20.0209	20.1572	20.1410	19.8973	19.1789	18.2127	17.3624 (92)
Temperature adjustment												0.0000
adjusted MIT	17.4203	17.8119	18.3464	19.0486	19.6299	20.0209	20.1572	20.1410	19.8973	19.1789	18.2127	17.3624 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8921	0.8599	0.8195	0.7464	0.6415	0.4963	0.3620	0.3957	0.5795	0.7599	0.8570	0.9001 (94)
Useful gains	647.6491	711.7926	725.6992	709.3847	631.9630	480.7552	336.3856	348.5389	486.5331	585.9960	614.3983	626.2386 (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	1348.8646	1324.1436	1211.9072	1026.2999	800.1936	541.4671	355.3142	372.9644	581.3479	865.6774	1126.2980	1340.1575 (97)
Space heating kWh	521.7043	411.4998	361.7387	228.1790	125.1636	0.0000	0.0000	0.0000	0.0000	208.0830	368.5678	531.1556 (98a)
Space heating requirement - total per year (kWh/year)												2756.0917
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	521.7043	411.4998	361.7387	228.1790	125.1636	0.0000	0.0000	0.0000	0.0000	208.0830	368.5678	531.1556 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2756.0917
Space heating per m2										(98c) / (4) =		28.7993 (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	521.7043	411.4998	361.7387	228.1790	125.1636	0.0000	0.0000	0.0000	0.0000	208.0830	368.5678	531.1556 (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)	565.2268	445.8286	391.9163	247.2145	135.6052	0.0000	0.0000	0.0000	0.0000	225.4420	399.3150	575.4665 (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	244.3321	216.0565	229.7402	202.7878	197.0469	178.0914	176.2819	183.0677	184.8111	205.4082	217.5417	241.7955 (64)
Efficiency of water heater (217)m	85.7166	85.4809	85.0732	84.3250	83.0705	79.8000	79.8000	79.8000	79.8000	84.0888	85.2321	79.8000 (216)
Fuel for water heating, kWh/month	285.0465	252.7541	270.0499	240.4836	237.2044	223.1722	220.9047	229.4082	231.5928	244.2753	255.2343	281.8989 (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	27.1427	21.7749	19.6059	14.3641	11.0953	9.0649	10.1215	13.1563	17.0887	22.4213	25.3248	27.8971 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-43.9725	-61.5860	-87.9395	-98.1848	-105.2694	-98.0082	-96.7599	-91.6205	-82.4895	-70.0634	-48.1836	-38.0617 (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)

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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	(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	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-26.0893	-54.7395	-108.5512	-162.6948	-214.8157	-215.7602	-213.2549	-180.7312	-132.6721	-78.2083	-34.8053	-20.6445 (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	(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	(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	(235d)
Annual totals kWh/year												
Space heating fuel - main system 1												2986.0149 (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												2972.0249 (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)												219.0573 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-2365.1061 (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												3897.9911 (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	2986.0149	0.2100	627.0631 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2972.0249	0.2100	624.1252 (264)
Space and water heating			1251.1884 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	219.0573	0.1443	31.6167 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-922.1389	0.1347	-124.2470
PV Unit electricity exported	-1442.9671	0.1260	-181.7478
Total			-305.9947 (269)
Total CO2, kg/year			988.7396 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.3300 (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	2986.0149	1.1300	3374.1968 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2972.0249	1.1300	3358.3882 (278)
Space and water heating			6732.5850 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	219.0573	1.5338	335.9974 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-922.1389	1.4980	-1381.3425
PV Unit electricity exported	-1442.9671	0.4623	-667.1428
Total			-2048.4853 (283)
Total Primary energy kWh/year			5150.1979 (286)
Target Primary Energy Rate (TPER)			53.8200 (287)